Dissertation on

A STUDY ON EVALUATION, INDICATIONS, SURGICAL TECHNIQUES AND COMPLICATIONS OF VARIOUS ORBITOTOMIES DONE IN A TERTIARY CARE CENTRE

Submitted in partial fulfillment of requirements of

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BRANCH III

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MADRAS MEDICAL COLLEGE

CHENNAI – 600 003

THE TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY

CHENNAI - 600 032

APRIL - 2018

CERTIFICATE

This is to certify that this dissertation entitled **"STUDY ON EVALUATION, INDICATIONS, SURGICAL TECHNIQUES AND COMPLICATIONS OF VARIOUS ORBITOTOMIES DONE IN A TERTIARY CARE CENTRE"** is a bonafide record of the research work done by **Dr.ARUNA.S.K**., Post graduate in Regional Institute of Ophthalmology, Madras Medical College and Research Institute, Government General Hospital,Chennai-03, in partial fulfillment of the regulations laid down by The Tamil Nadu Dr.M.G.R. Medical University for the award of M.S.Ophthalmology Branch III, under my guidance and supervision during the academic years 2015-2018.

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I wish to express my sincere thanks to my husband, parents, friends and all my colleagues who helped me in bringing out this study.

Last but not the least, my heartful gratitude and sincere thanks to all my Patients without whom this endeavor would not have been possible.

DECLARATION BY THE CANDIDATE

I hereby declare that this dissertation entitled, **"STUDY ON EVALUATION, INDICATIONS, SURGICAL TECHNIQUES AND COMPLICATIONS OF VARIOUS ORBITOTOMIES DONE IN A TERTIARY CARE CENTRE"** is a bonafide and genuine research work conducted by me under the guidance of **Prof. Dr.R. Malarvizhi, M.S., D.O.,** Head of Department of Orbit and Oculoplasty services, Regional institute of ophthalmology & Government Ophthalmic hospital. Chennai-600008.

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CERTIFICATE OF APPROVAL

To
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Dear Dr.Aruna.S.K.,

The Institutional Ethics Committee has considered your request and approved your study titled **"A STUDY ON EVALUATION, INDICATIONS, SURGICAL TECHNIQUES AND COMPLICATIONS OF VARIOUS ORBITOTOMIES DONE IN A TERTIARY CARE CENTRE" - NO.19012017 (III).**

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CONTENTS

"A Study on Evaluation, Indications, Surgical techniques and complications of various orbitotomies done in a tertiary care centre"

INTRODUCTION

It is challenging to decide the surgical access to orbit because of the complex anatomy of the orbital structures. Careful planning is required when we plan a biopsy, orbital fracture repair or a tumor removal to decide on the ideal approach.

The surgical approach in which we access the anterior half of the orbit is termed as anterior orbitotomy. The type of the incision is determined by the location of the lesion in the orbit. Orbital rim incisions are the Kronlein, direct brow, sub-brow, Lynch and inferior rim incisions. Similarly, various eyelid incisions are sub-ciliary vertical lid-split, sub tarsal and upper lid crease.[1] All of these approaches are associated with advantages and disadvantages. Many other approaches are obsolete in present day practice because of poor cosmetic outcome. For the medial orbital lesions Lynch incision provides good exposure. but main disadvantage is visible scarring.[2] The sub-ciliary approach for orbital floor reconstruction allows excellent surgical exposure, but complication includes lower lid retraction.[3,4]

To alleviate the complications associated with cutaneous incisions like disfiguring scars and risk of entropion, the transconjunctival approach is being preferred these days as orbital septum is not involved[4] . To approach the lateral orbit and retrobulbar space lateral orbitotomy has been preferred over days.

This dissertation is unique because it describes the various techniques in orbital surgery which provides good surgical exposure for the pathology involved and the complication rates of each approach.

REVIEW OF LITERATURE

Brett. W. Davies et al studied on transconjunctival incision and discussed the indications and complications of the approaches of orbitotmy. The authors have discussed in detailed their preferred technique. They concluded that transconjunctival approach provided a good surgical access with a lower incidence of complications and a better outcome than transcutaneous approaches.[13]

There is a study on deep orbital dermoid cyst done by Kumar. R et al suggesting that CT and MRI are safe, reliable easy and effective imaging methods for diagnosing size and location of orbital dermoid cyst which are the most important determinants for deciding the management. Complete surgical excision of the dermoid without rupture of the cyst wall is the treatment of choice.[12]

Lateral canthotomy orbitotomy: a rapid approach to the orbit, a study by Hameed- Azzam S concluded that the lateral canthotomy approach orbitotomy is safer, minimally invasive and rapid approach for the access to the lesions in the lateral orbit and optic nerve as no bone is removed and also in the post-operative period recovery of the patient is rapid with minimal inflammation or chemosis. This approach is also flexible, permitting the clinician to increase exposure to the orbit per-operatively by swinging the lower lid if required.[11]

Anteromedial approach to orbit, a study conducted by Haluk Deda et al in 16 patients said that medial approach to the orbit provides a wider working space and direct exposure while protecting neurovascular structures. The common indications for surgery were dermoid cysts, Fibro-osseous lesions and cavernous hemangiomas. There were acceptable cosmetic results as the lateral nasal skin incision healed well.[14]

An article published by Giraddi GM et al comparing the trans conjunctival and sub ciliary approach in the management of floor fracture with 10 petients in each group showed the results as transient entropion was common in transconjunctival approach and transient entropion was common in the subciliary approach.[15]

Endonasal approach for cavernous hemangioma of orbital apex was studied by Locatelli M et al and the concluded that endoscopic endonasal approach was successful in the resection of the hemangioma and endonasal endoscopic approach is to be considered in the management of extraconal orbital lesions.[16]

Lenzi et al reported the results of a systematic review of the literature on the endoscopic endonasal approach to intraconal cavernous haemangiomas which are the most common benign orbital lesion. The surgical management of medial orbital lesions is challenging via external approach because of the narrow surgical field is and damage to neuro vascular and muscular structures of the orbit. The evolution of transnasal orbital surgery especially for intraconal tumor is a new and rapidly expanding field. The results of endoscopic management of intraconal tumours like cavernous haemangiomas are feasible and safe. The critical step in the endonasal surgeries is the management of the medial rectus muscle which is mandatory to expose the intraconal space.[17]

ANATOMY OF THE ORBIT

The surgeon should have a complete understanding of orbit as it is a complex territory. Periorbital structures like the nose and paranasal sinuses are also sometimes involved in orbital pathology,and therefore should always be recognized and evaluated.

There are four orbital spaces which are described below that have clinical and surgical importance. The potential space between the orbital bones and the periorbita is called the sub-periosteal space and its commonly approached surgically. The extraconal space is the space between the periorbita and the fascial septa which interconnects the extraocular muscles, and this space includes the periosteum and orbital septum. The intra conal space is bounded by the posterior Tenons capsule to the extaocular muscle from the annulus of zinn. The episcleral space extend between tenon capsule and globe. The extraconal space is not separated anatomically from the intraconal space except at the area of the intermuscular septum.

EMBRYOLOGY AND DEVELOPMENT

The orbit embryologically develops from the mesoderm which surrounds the optic vesicle and optic stalk. The roof of the orbit is formed from the mesenchymal capsule of forebrain. The floor and lateral walls of the orbit develops from the maxillary process. Medial wall of orbit is formed by the lateral nasal process and the bones of base of skull forms to the roof, medial and lateral walls.

The first to be laid down among the seven bones forming the orbit is the ethmoid which if formed at 6-8 weeks of gestation. Consolidation of trochlea begins at about 9 weeks of gestation. The lesser wing of the sphenoid is an exception from other bones of orbit in being cartilaginous initially, whereas other bones of the orbit being membranous and ossification begins at the 3rd month. Between 6-7 months fusion occurs.

At birth size of Orbit is 55% of adult size. About 79% of adult size at 3 years of age and at 7years of age 94 %. The size and shape of the orbit is influenced by the growth of face, paranasal sinuses and cranium. The angle between the orbital axes is around 180° in the beginning and both the orbits are placed at lateral sides of head. Later at 3 months of age the angle subtended by both the orbits diminishes to approximately 105° and the angle is 71° at birth thus placing the orbits anteriorly. The angle between both the orbital axes attains adult measurement of 68° by the age of 3. The eyeball develops faster than the orbit itself during development causing protrusion of anterior half of eyeball from the orbit.[5]

WALLS OF THE ORBIT

The orbit comprises of four walls- medial, lateral, roof and floor, all of which are lined by periosteum. The medial walls of both the orbits are parallel to each other whereas the lateral walls are at an angle of 90 degrees with each other.

ROOF OR VAULT

The roof of the orbit is formed by orbital plate of the frontal bone and is triangular in shape, and posteriorly it is completed by the lesser wing of sphenoid. The roof is thin, fragile and translucent except at the lesser wing of the sphenoid. The roof is facing downwards and slightly forwards and flattens posteriorly and is concave anteriorly

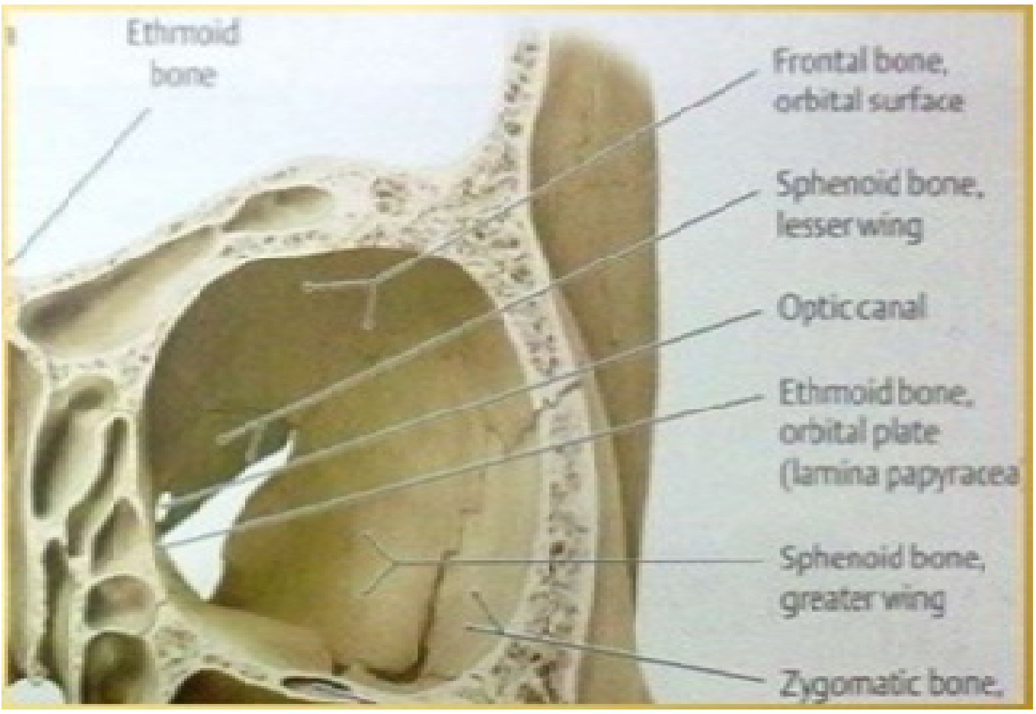


Figure 1: Bones forming roof of orbit

Roof of orbit includes

- Lacrimal fossa – this fossa is lying behind the zygomatic process of the frontal bone. The lacrimal fossa lodges the orbital part of lacrimal gland and posterior part of the fossa is known as accessory fossa of Rochon – duvigneaud which contains some orbital fat in it.
- Trochlear fossa for the superior oblique muscle is located anteromedially which is a small depression 4mm from the orbital margin. Occasionally, the ligaments attached to it are

ossified forming spicule of bone which is called the spina trochlearis.

- The cribra orbitalia are small apertures allowing veins to pass and they are more marked in fetus and infants.[6]

MEDIAL WALL

The medial wall is almost oblong and is slightly convex or sometimes flat lying parallel to the sagittal plane. The medial wall is formed by four bones which are united by vertical sutures. They are

- Lacrimal bone
- Frontal process of maxilla
- Small part of the body of sphenoid
- Orbital plate of ethmoid-largest

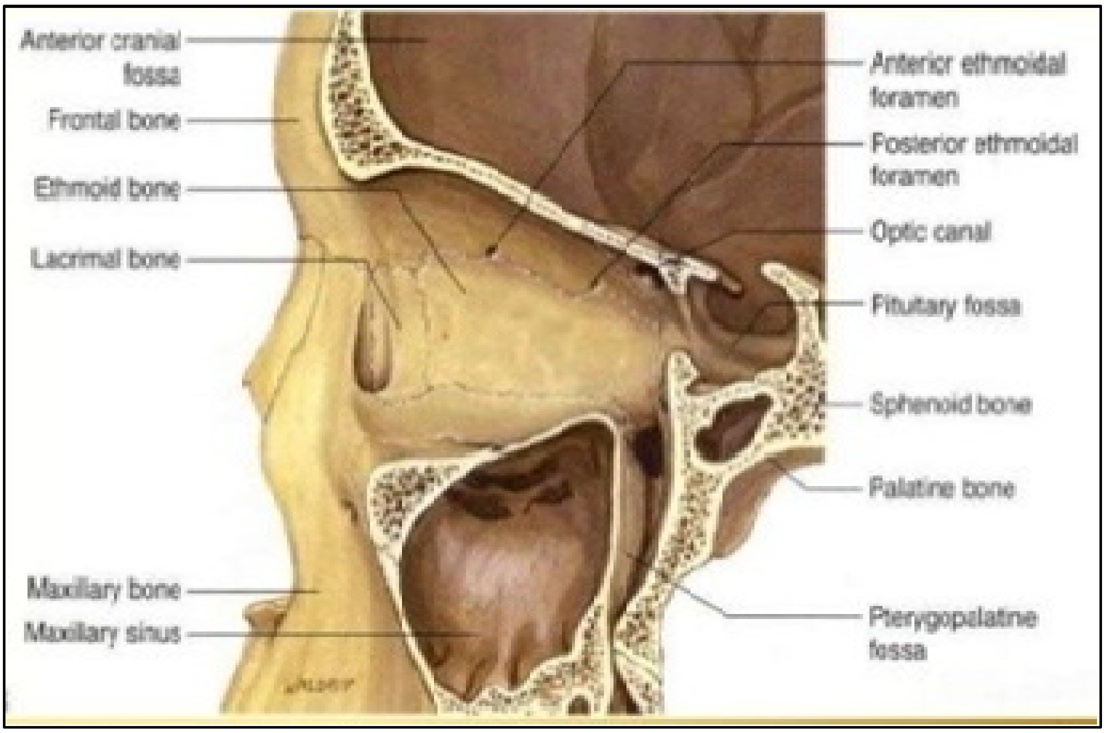


Figure 2: Bones forming medial wall of orbit

Medial wall consists of the following structures:

- Lacrimal groove - formed at the junction of lacrimal bone and frontal process of the maxilla and lacrimal bone. The lacrimal groove lodges the lacrimal sac. It has anterior and posterior lacrimal crests forming its boundaries. It has no definite upper boundary and downwards it continues as the osseous nasolacrimal canal. Its depth is around 5mm and it gradually becomes shallower as it is ascending and height of which is about 14 mm.

- The fronto ethmoidal suture lodges the ethmoidal foramens both anterior and posterior at the junction of the medial wall and roof. It is the thinnest of all orbital walls. The orbital plate of the ethmoid (Lamina papyracea) is so thin that the ethmoid sinus infections can easily extend into the orbit.[7]

FLOOR OF THE ORBIT

The floor of the orbit is triangular in shape and it slopes slightly laterally and downwards. It is the shortest of all the orbital boundaries and it is formed by

- Orbital surface of zygomatic bone
- Orbital plate of maxilla
- Orbital process of palatine bone

Anteriorly, the floor of orbit continues with the lateral wall but is separated from the same by the inferior orbital fissure posteriorly

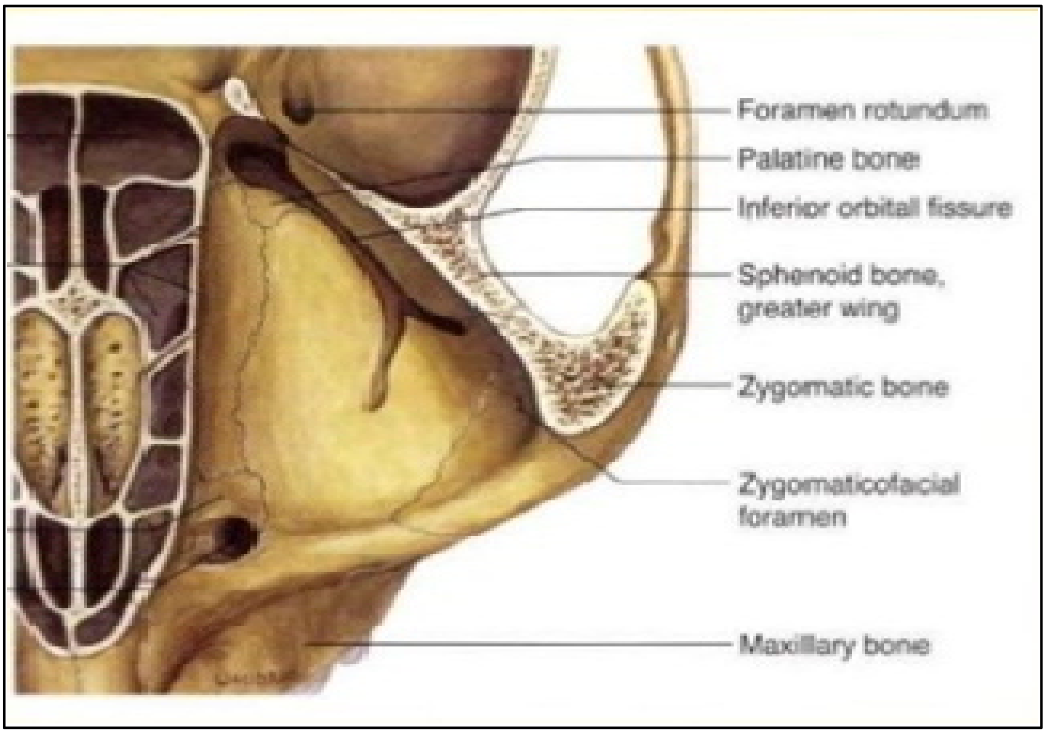


Figure 3: Bones forming floor of orbit

Orbital floor consists of the following structures;

- Infraorbital sulcus - floor is traversed by this sulcus traverses the floor which runs forwards from the inferior orbital fissure.
- The inferior oblique muscle which is located lateral to the opening of the nasolacrimal canal has its attachment in floor of orbit.
- Infraorbital canal - midpoint of infra orbital sulcus transforms into a canal which is completed by a plate of bone at the infra orbital suture which opens at the infraorbital foramen.

The floor of orbit is thinnest at the infraorbital canal and infraorbital groove. Hence, the maxillary sinus tumours and dental infections from below can easily invade the orbit.

LATERAL WALL

This is a triangular wall and it makes an angle of about 45° with the median plane. It slightly upwards in the lower part and faces anteromedially. Posteriorly, it is convex and flat centrally and deeply concave anteriorly. The orbit is separated from the middle cranial fossa and temporal fossa by the lateral wall.

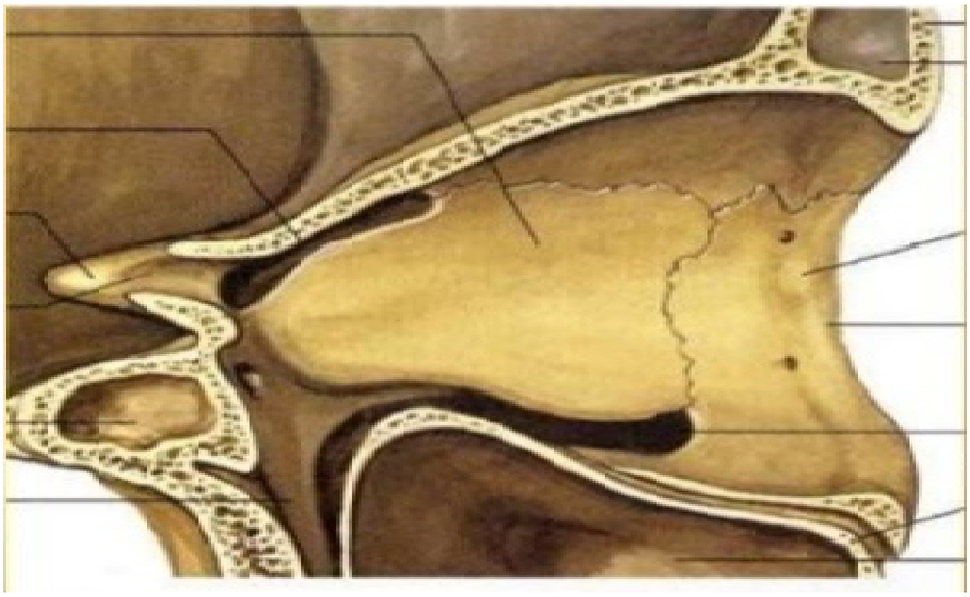


Figure 4: Bones forming lateral wall of orbit

Lateral wall is formed by the following 2 bones

- Posteriorly orbital surface of greater wing of sphenoid posteriorly and
- Orbital surface of the zygomatic bone anteriorly.

Lateral wall includes

- Spina musculi recti lateralis, that is a small projection of bone present in the inferior margin of superior orbital fissure to which a part of lateral rectus muscle is attached.
- Zygomatic groove runs from inferior orbital fissure to a foramen located in the zygomatic bone.
- Whitnall's tubercle - is a small projection on the orbital surface of the zygomatic bone behind the lateral orbital margin. Gives attachment to suspensory ligament of the eyeball, lateral check ligament and levator palpebrae superioris aponeurosis.

Lateral wall is the thickest orbital wall particularly at the orbital margin.

THE ORBITAL MARGINS

The orbital margins is quadrilateral with spiral edges and rounded corners. The inferior orbital margin continues as anterior lacrimal crest and superior margin is continuous with the posterior lacrimal crest.

Each wall measures around 40 mm, but usually the width is greater than the height. The orbital margin is formed by maxillary, frontal and zygomatic elements.[8]

SUPERIOR MARGIN

Superior margin is formed by the orbital arch of the frontal bone. It is round in medial one third and sharp in lateral two third. At the junction of medial one third and lateral two third, about 25mm from the midline supraorbial notch is located. Sometimes it converted into a foramen due to ossification of the ligament. Through this foramen the supraorbital nerves and vessels traverses.

Sometimes a second notch or foramen may occur medial to it. A groove from these notch or foramina are occasionally seen. In approximately 50% of skulls there is a supraciliary canal. It also consists a small opening close to the supraorbital notch.

LATERAL MARGIN

Lateral margin is the strongest of all the orbital walls. It comprises of the zygomatic bone and zygomatic process of the frontal bone. The suture which is present between these two bones is easily felt.

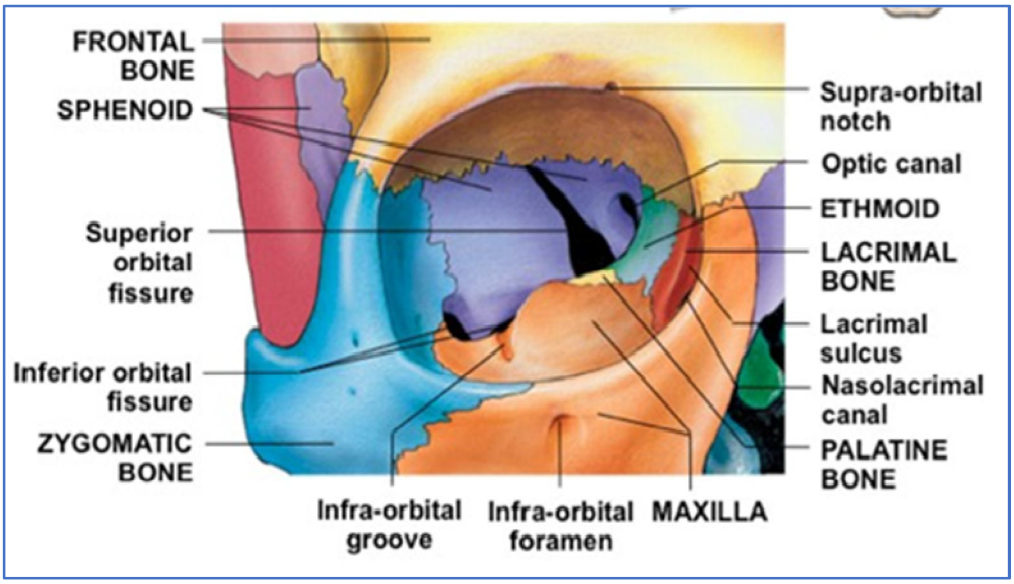


Figure 5: Orbital margins

INFERIOR MARGIN

It is constituted by the maxillary bone and the zygomatic bone. The suture between the two bones is marked by a tubercle sometimes. This tubercle is felt just above the infraorbital foramen. This margin is mildly elevated above the plane of floor of the orbit.

MEDIAL MARGIN

Medial margin comprises of the anterior lacrimal crest which is present on the frontal process of the maxilla and the posterior lacrimal crest of the lacrimal bone. Medial margin is not a continuous margin, but it ascends from the anterior lacrimal crest to the maxillary frontal process and to the superior margin of orbit. Superiorly, it is difficult to identify the medial margin whereas inferiorly the margin is sharp and hence can be felt easily.

ORBITAL FISSURES

SUPERIOR ORBITAL FISSURE

It is found between the greater and lesser wings of sphenoid and the fissure is a connection between the middle cranial cavity and the orbit. It is identified at the junction of the lateral wall and roof of the orbit. Superior orbital fissure is comma shaped. The medial end is wider below the optic foramen and in its lateral end it tapers forward. The length of superior orbital fissure is 22m long. The long axis is directed upwards, laterally and forwards.[9]

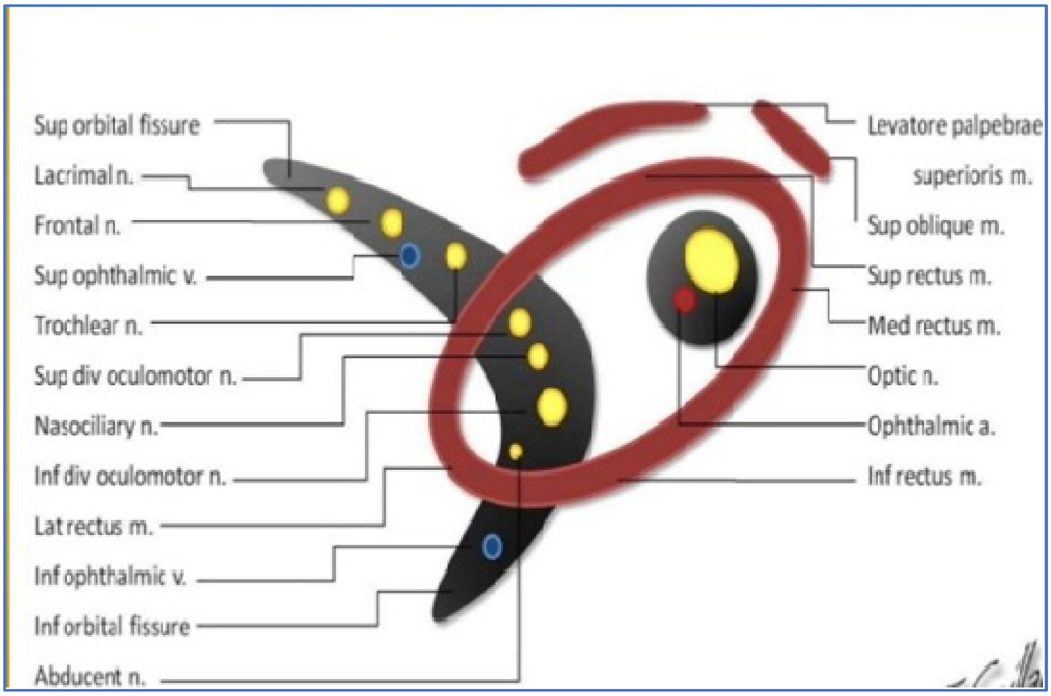


Figure 6: Superior Orbital Fissure and structures passing through it.

The common tendinous ringof the rectus muscle divides the fissure into medial, lateral and middle parts. The structures passing through each part are as follows:

In the lateral part, above the annulus passes –

- Frontal nerve
- Lacrimal nerve
- Trochlear nerve
- Recurrent lacrimal artery
- Superior ophthalmic vein

In the middle part –

- Sympathetic roots of ciliary ganglion
- Naso ciliary nerve
- Superior division of oculomotor nerve
- Inferior division of oculomotor nerve
- Abducent nerve
- Sometimes the ophthalmic veins.[10]

In the medial part, below the annulus –

- Sympathetic nerves from plexus around Internal carotid artery.
- Inferior ophthalmic vein

INFERIOR ORBITAL FISSURE

Between the lower margin of orbital surface of greater wing of sphenoid and orbital process of the palatine bone and maxilla lies the inferior orbital fissure. It forms a connection between the infratemporal fossa and pterygopalatine fossa with the orbital cavity. It is identified between the floor and lateral wall of the orbit.[6]

It starts inferolateral to the optic foramen from where it runs anterolaterally. Its length is about 20 mm and about 2 cm from the inferior orbital margin it ends. It is obliterated in the living subject by muscle of muller and periorbita. It is centrally narrower than at its extremities. The width of the fissure is dependent on the stage of development of the maxillary sinus and so is relatively wider till infancy.

It transmits

- Orbital & periosteal branches from the pterygopalatine ganglion.
- Infraorbital and zygomatic nerves
- Branch from inferior ophthalmic vein to the pterygoid plexus.[10]

RELATIONS OF THE ORBIT

SUPERIOR RELATIONS

The roof is formed by the orbital plate of the frontal bone. It contains the frontal air sinus. Sometimes the ethmoid air cells can also be present in the roof. Superiorly the roof of orbit is anatomically related to the frontal bone of cerebral hemisphere and the meninges.[6]

The frontal nerve and supraorbital artery are in close relation to the periorbita. Inferior to the supraorbital artery and frontal nerve are superior rectus and levator palpebrae. The trochlear nerve is medial and lies in contact with periorbita. Lacrimal gland lies inside the lacrimal fossa. At the junction of roof and medial wall one can locate the superior oblique muscle.

MEDIAL RELATIONS

Medially orbit is related to following structures from anterior to posterior: lateral nasal wall, sphenoidal air sinus, ethmoid sinus and the infundibulum. At the posterior end of the medial wall the optic foramen is found. The anterior relations to the medial wall are the lacrimal sac which is found surrounded by the lacrimal fascia. Posteriorly the medial wall is attached to orbicularis oculi muscle check ligament of medial rectus and septum orbitale. Medial rectus is found to be adjoining the medial wall.

Between the medial rectus and superior oblique muscle, the anterior and posterior ethmoidal along with infratrochlear and the terminal part of the ophthalmic artery are located.

INFERIOR RELATIONS

Just inferior to floor of orbit lies the maxillary sinus. The infraorbital nerves and vessels are running through the infraorbital canal. The floor is posteriorly related to a small sinus in the orbital process of palatine bone which may invade it. Inferior rectus adjoins the floor near the apex of the orbit and anteriorly it is separated by inferior oblique muscle and fat. In between the muscles or lateral to the lateral rectus is located the nerve to inferior oblique.

LATERAL RELATIONS

Laterally orbit is related in the anterior part to the temporal fossa containing temporalis muscle and posteriorly to the middle cranial fossa, meninges and temporal lobe of cerebral hemisphere.[10] The lateral rectus muscle is in contact with the whole of the lateral wall. Lacrimal nerve and artery are above it. Inferior pole of the lacrimal gland reaches the lateral wall.

SURGICAL SPACES IN THE ORBIT

Orbit is divisible into four spaces.[11]

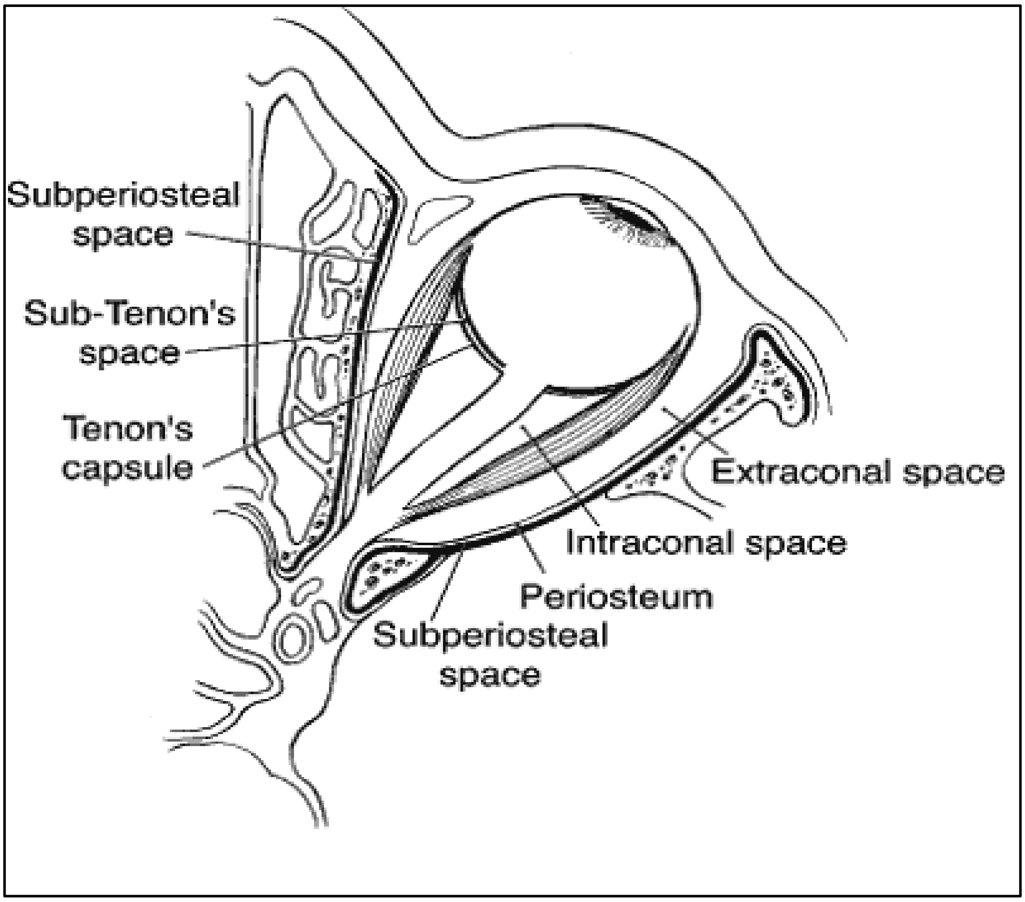


Figure 7: Surgical spaces in orbit

Subperiosteal space:

Potential space between orbital bones and the periorbita. It is limited anteriorly by strong adhesions of the periorbita to orbital rim. Subperiosteal abscess and mucocele are commonly seen in this space.

Peripheral orbital space (Anterior space):

This space is bounded peripherally by periorbita, internally by the four extraocular muscles with the inter-muscular septa and anteriorly by the septum orbitale. Posteriorly it merges with central space.

The contents of this space are

- Fat
- Muscles-superior oblique, inferior oblique, levator palpebrae superioris
- Nerves – lacrimal, frontal, trochlear, anterior and posterior, ethmoidal
- Veins – superior ophthalmic and inferior ophthalmic
- Lacrimal gland
- Half of lacrimal sac

Central space (muscular cone, posterior or retrobulbar space):

It is bounded anteriorly by tenon’s capsule lining the back of the eye and peripherally by the extraocular recti muscle and their intermuscular septa. In the posterior part where intermuscular septa are imperceptible, it continues with the peripheral orbital space.

Its contents include

- Optic nerve and its meninges
- Superior and inferior division of oculomotor nerve
- Abducent and Nasociliary nerve
- Ciliary ganglion
- Ophthalmic artery, superior ophthalmic vein
- Central orbital fat

Sub tenon's space:

It is a potential space around the eyeball between the sclera and tenon's capsule. Pus collected in this space is drained by incision of tenon's capsule through the conjunctiva.

4. Blood vessels of the orbit

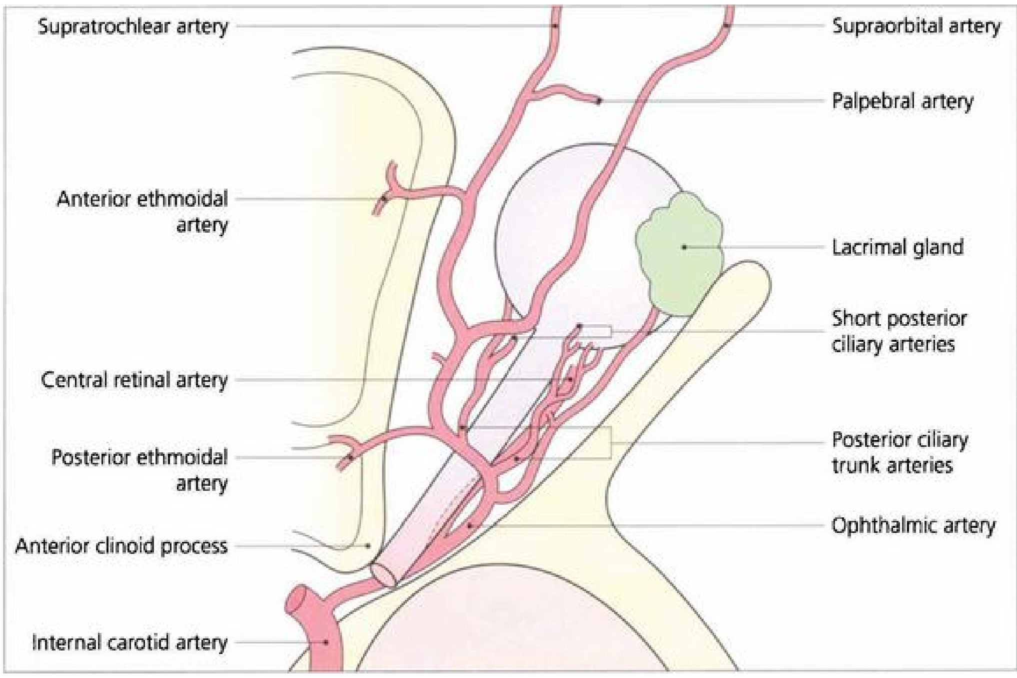


Fig.8 Arterial supply of the orbit

i. Arterial circulation[41] :

• Internal Carotid artery – branch of which is the ophthalmic artery

• External Carotid artery -

A. Internal maxillary artery gives the infraorbital artery

B. Middle meningeal artery gives the orbital branch

ii. Venous Circulation:

The three main veins within the orbit are

(i) Superior ophthalmic vein

(ii) Inferior ophthalmic vein

(iii) Central retinal vein.

By the union of the supraorbital and angular vein of the face the superior ophthalmic vein is formed. Branches from large ethmoid branches, from the face, two superior vortex veins and the lacrimal vein drains into superior ophthalmic vein. On the orbital floor, the inferior ophthalmic vein begins as a venous network. It receives branches from the lower lid, the region of the lacrimal sac, the inferiorrectus and inferior oblique muscles and the two inferior vortex veins.

iii. The Lymphatics

There are no lymph nodes or lymphatic vessels have been demonstrated in the orbit. Probably the main lymph drainage from the orbit are accompanied by the veins through the inferior orbital fissure into the internal maxillary nodes then drains into the superior deep cervical nodes.

5. Nerves of the Orbit

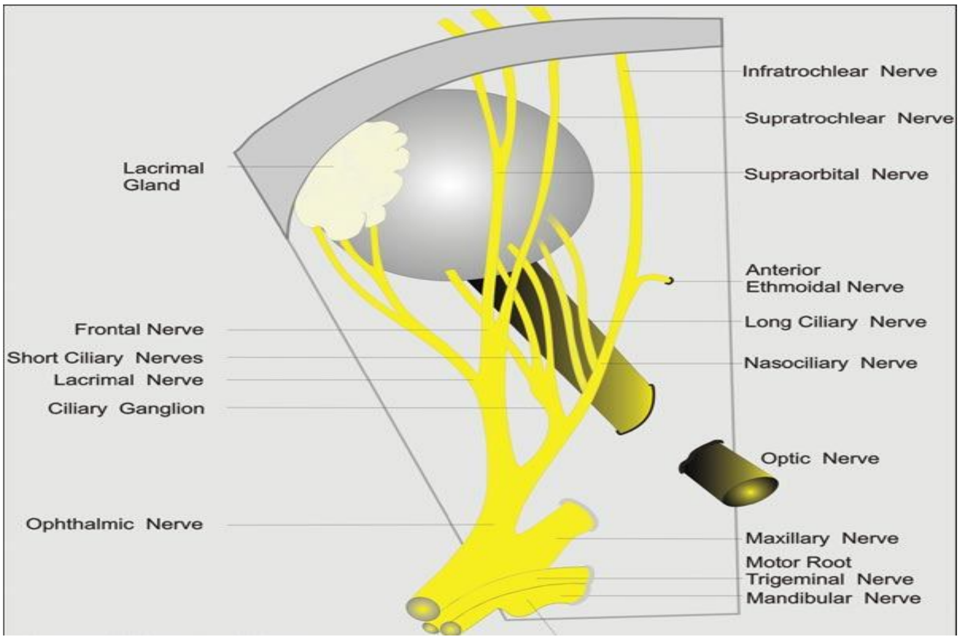


Fig.9 Nerves of the orbit

i. Optic nerve for vision

ii. Cranial nerves III, IV, VI : Supplies motor and parasympathetic fibres to the extra ocular muscles and the intra-ocular muscles and to the LPS.

iii. 1st and 2nd division of cranial nerve V: Sensory to eye ball, the lacrimal gland, the conjunctiva, the lids and large areas of the surrounding skin of the face, as well as conveying parasympathetic fibres.

iv. Cranial nerve VII : supplies parasympathetic fibres to the lacrimal gland.

v. Sympathetic : lacrimal gland, the orbital plain (and striated) muscle and vasomotor to the orbit.

6. Other structures in the orbit are:

- ❖ Lacrimal gland,
- ❖ Lacrimal sac and
- ❖ Orbital fat.

INTRODUCTION TO ORBITOTOMY

Orbital surgery in recent years is characterized by significant changes which are results of improved techniques for imagine, surgical instrumentations, intra-operative visualisation and haemostasis.In addition, there is increased cosmetic awareness amongst people these days which drives surgeons to seek for techniques that have relatively small or hidden incisions.

There are several important factors that forms the basis of a successful orbital surgery. Firstly, careful evaluation of the patient pre-operatively and understanding by the surgeon of the exact characteristics and location of the pathology. The second factor to be considered isthe goals of surgical interventions whether it is for diagnostic, therapeutic or cosmetic purpose. Pre-operative factors like age, sex,race and past medical and surgical history of the patient are essential as it will also have a major impact on the surgical approach.

EVALUATION OF THE PATIENT WITH ORBITAL DISEASE:

For complete evaluation of the patient with any orbital lesions will include a proper history taking, relevant imaging, confirmation with histopathology and systemic investigations particularly related to the lesion.

A thorough history of the patient is to be recorded which includes the following:

- Duration of the disease course:

Acute – infections and trauma

Subacute- neoplasms and inflammatory lesion

Chronic- neoplasm and inflammation

- Progression
- Biological effects due to the disease like defective vision, double vision, pain, swelling, watering should be asked for.
- Systemic illness
- Medical history

OCULAR EXAMINATION:

A complete ocular examination is to be carried out in a step by step approach;

- Visual acuity
- Refraction
- Intra ocular pressure
- Anterior and posterior segment examination
- EOM
- Slit lamp examination
- FORCED DUCTION TEST

It is performed in the anesthetized eye by mechanically moving the eye in to various positions to determine resistance to passive movements in restrictive pathology thus ruling out paralytic causes.

MEASUREMENTS:

- In case of patients presenting with proptosis, measurement of the proptosis is to be done with exophthalmometer like Hertel's or Luedde's.
- Horizontal or vertical dystopias can be measured by two-ruler method.

EXOPHTHALMOMETRY (PROPTOMETRY)

Exophthalmometers are used to measure the proptosis, by measuring the distance from outer orbital margin to the corneal apex, while the eyes look straight.

TYPES OF EXOPHTALMOMETRY

a. Absolute – compared with the normal values.

b. Comparative – compared from time to time.

c. Relative – compared with other eye (difference of >2 mm is important).

HERTEL'S EXOPHTHALMOMETER (1905)

Fig.10 Hertel's Exophthalmometer

This is the most commonly used exophthalmometer[42]. This instrument is binocular and rests on each lateral bony orbital margin. This allows an observer to view the images of the corneal apexwith the aid of mirrors, superimposed upon measuring scale. This measures the distance between the apex of the uncovered cornea to the temporal margin of the orbit

CLINICAL ASSESEMENT OF THE MASS:

- Inspection of the size, location and extension of the mass
- Palpation of the orbital rim, finger insinuation and retropulsion to be done
- Pulsations in case of vascular pathology
- Auscultation to rule out vascular lesions.

ROLE OF IMAGING:

The most common imaging modalities of the orbit are computed tomography, magnetic resonance imaging and ultrasonography. Of all the above imaging techniques CT is most useful and thus commonly used. MRI and USG are indicated for special conditions and may be very useful.

COMPUTED TOMOGRAPHY:

In the CT scan, brighter areas depict the areas of greater density and darker areas represent areas of mower densities. High anatomical accuracy is obtained with 2 mm slices of CT orbit. Bony lesions are best imaged with CT scan. Contrast enhanced CT are useful in diagnosis of cystic and vascular lesions[18-20]. Both axial and coronal sections should be taken for every case. With axial and coronal section we can come to a conclusion of whether the lesion is anterior or posterior, superior or interior.

Maximum information can be obtained by doing a step by step examination of the CT, which includes

- Bone orbit
- Eye ball
- Extraocular muscles
- Extraconal and intraconal tissues
- Sellar and parasellar regions

Any space occupying lesion is to be studied in the following way to assess the size of the lesion, shape of the lesion, location whether intra or extraconal, circumscription of lesion, effect on surrounding orbital structures as well the bones. Well circumscribed lesions are usually benign conditions whereas irregular margins are suggestive of malignancy. Diffuse lesions may indicate inflammatory origin. Similarly, bony erosion is suggestive of a malignant lesion, bone expansion is a feature of slow growing benign lesions.

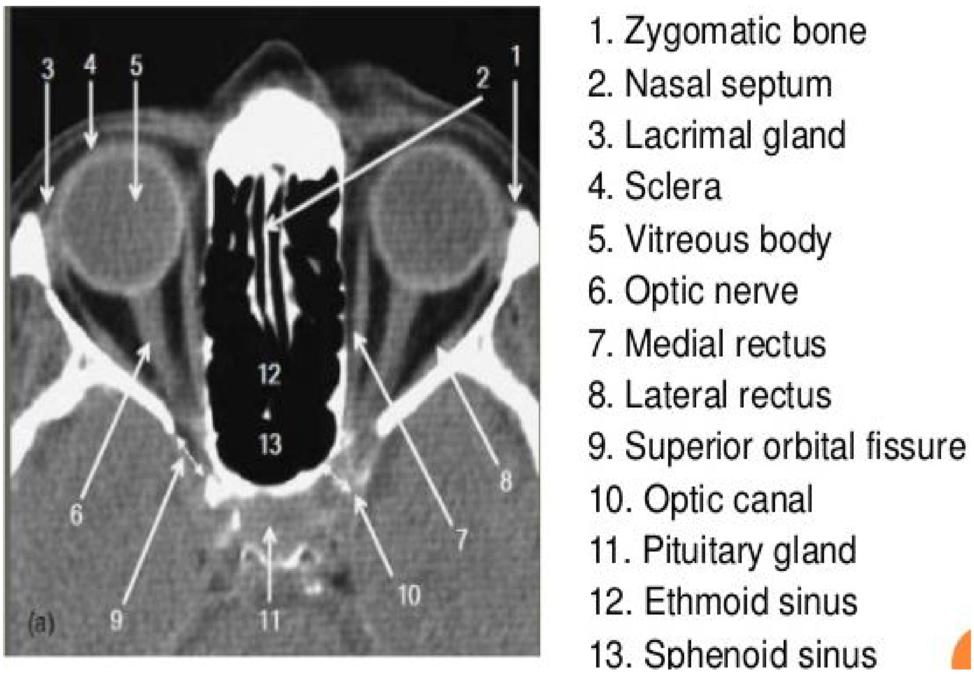
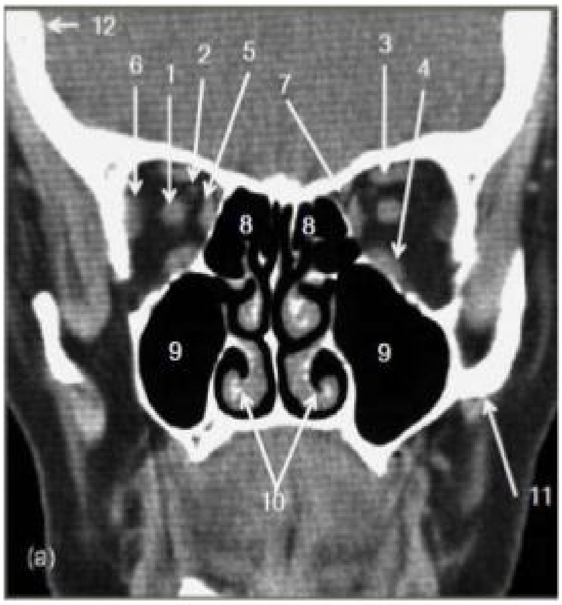


Figure. 11 CT Orbit Axial view



1. Optic nerve
2. Ophthalmic artery
3. Superior rectus
4. Inferior rectus
5. Medial rectus
6. Lateral rectus
7. Superior oblique
8. Ethmoid sinus
9. Maxillary sinus
10. Inferior turbinates
11. Zygomatic bone
12. Frontal bone

Figure. 12 CT Orbit Coronal section

MAGNETIC RESONANCE IMAGING:

In MRI, the tissues with higher number of protons will emit a stronger signal and tissues with less number of protons emits a weaker signal as in example of a cortical bone with almost no protons is black in MRI. Based on the relaxing time weightage can be given to as T1 and T2. In T1 water is hypo intense and in T2 it is hyperintense. Contrast enhancement (Gd-DTPA) is best appreciated with fat suppression T1 weighted films. T1 image gives better anatomical details but are at risk of motion artifacts. Many of the tumors are hypo intense in T1 and hyperintense in T2. Vascular lesions show contrast enhancement whereas scar tissues and cystic lesions lack enhancement with contrast. To assess the optic nerve and orbital apex MRI is most useful tool[18,19, 21-23].

A **B**

Axial T-1-weighted image without fat suppression or gadolinium. The vitreous is dark (hypointense) relative to the bright signal from fat. A well-circumscribed mass is clearly visible in the right orbit, also hypointense. Most orbital lesions are dark in T1 prior to gadolinium injection

Axial T-1 image with fat suppression and gadolinium. Note how both the vitreous and fat are dark, but the extraocular muscles become bright. The orbital mass is now clearly visible. This technique should be performed in all orbital MRIs.

Figure 13: A- MRI Orbit with fat suppression with contrast and B-without fat suppression with contrast

ORBITAL ULTRASOUND:

The principle of ultrasound in imaging is sound waves in the frequency of ultrasonic range are made to pass through the tissues and the reflected waves are transformed into 2D images in case of B scan and linear images as seen in A scan. Brighter structures are considered highly reflective tissues[18,19, 24] and vice versa. it is an adjunctive tool in orbital imaging particularly used in diagnosis of cystic lesions of orbit.

a) **Low reflectivity:** Low reflectivity in B scan is suggestive of organizing hematoma in peripheral space, mucocele, varix, benign mixed tumour, lymphoma, inflammatory tumour rhabdomyosarcoma, neurilemmoma, fibrous histiocytoma and capillary hemangioma.

b) **Medium reflectivity:** suggestive of dermoid, optic nerve glioma and meningioma.

c) **High reflectivity:** seen in cavernous hemangioma, lymphangioma, most carcinomas and vascular neoplasm.

Advantages:

- ✓ It is a non-invasive procedure and no exposure to radiation
- ✓ Assess kinetic properties of orbital lesions
- ✓ OP procedure
- ✓ Can be performed by an ophthalmologist and ideal for follow-up.

Disadvantages:

- ❖ Lesion in the posterior aspect of the orbit may not be picked up.

SURGICAL TECHNIQUES

In general, anterior aspect of orbit is ideally approached by anterior approach to orbit and there is no necessary for any bone removal. At times, lesions encroaching into the posterior aspect of the orbit can also be approached via an anterior approach, but exposure may become sometimes inadequate, especially those pathologies which has been there deep inside orbital apex and having deeper degrees of infiltration. Factors which determine decision making in an anterior orbitotomy are nature of orbital involvement, depth and location. More than this the key factor which decides incision and surgical planning is type of quadrant and surgical space involvement.

After planning incision for each quadrant, each has advantages and disadvantages in certain aspects such as surgical exposure, difficulty in removing/handling the pathology, and final cosmetic outcome. The incision needs further modification depending upon the surgical space in which the lesion is present. Anterior intraconal lesions are approached via a transconjunctival peribulbar route which needs a possible removal of an extraocular muscle, extraconal lesions are approached through either conjunctival or cutaneous incision. Conjunctival, cutaneous, or coronal incisions are used for extra periorbital pathologies or decompression of orbit.

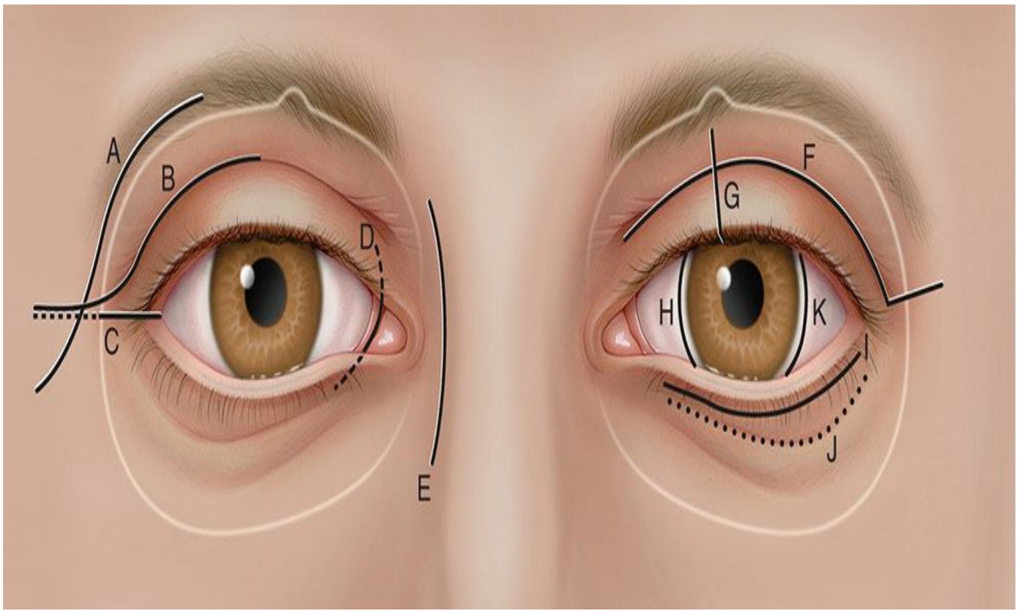


Figure. 14 Sites of surgical entry into orbit

A. Classic Stallard- Wright lateral orbitotomy

B. Eyelid crease lateral orbitotomy

C. Lateral canthotomy/ cantholysis orbitotomy

D. Trans caruncular medial orbitotomy

E. Lynch medial orbitotomy

F. Upper lid crease anterior orbitotomy

G. Vertical eyelid split superomedial orbitotomy

H. Medial bulbar conjunctival orbitotomy

I. Subciliary inferior orbitotomy

J. Transconjunctival inferior orbitotomy

K. Lateral bulbar conjunctival orbitotomy

SURGICAL APPROACHES TO THE ORBIT:

THE MEDIAL APPROACH

TRANS –CUTANEOUS SUBPERIOSTEAL APPROACH (LYNCH TECHNIQUE)

In this approach, wide exposure of the medial orbit is achieved by a medial cutaneous incision. Following incision, periosteum is elevated and subperiosteal careful dissection is done and then ethmoidal and sphenoidal sinuses, posterior and anterior ethmoidal arteries are accessed. Then the optic nerve canal is also accessed. This approach is useful for mucoceles, subperiosteal abscesses and lesions of other sinuses encroaching the orbit can be assessed through this approach. One more key structure that can be accessed is the lacrimal sac. This approach can be used for surgeries involving lacrimal sac such as biopsy, excision or dacrocystorhinostomy. The need for meticulous dissection through subcutaneous tissues, the longer operative time and delayed postoperative recovery and the visible cutaneous scar are the main disadvantages.

SUBCUTANEOUS EXTACONAL APPROACH

This approach has the advantage of cosmetically good incision. This provides a very rapid exposure of the medial orbit, floor and roof[27-30]. Through the medial conjunctiva, an incision is made in the conjunctival caruncle,and for further exposure incision is extended into superior or inferior conjunctival fornix.

Horner muscle is a key structure which defines the septum in the medial orbit. The origin of this muscle is from posterior lacrimal crest and inserts into eyelid forming a part of orbicularis sphincter. The caruncular incision follows the plane of horner muscle and the posterior surface of the orbital septum, thereby the surgeon remains posterior to lacrimal puncti, canaliculi and the lacrimal sac. The approach then proceeds to the posterior lacrimal crest, the subperiosteal space is entered. By this approach, the medial orbital wall, roof and floor can be assessed for procedures such as orbital decompression and fracture repair. Other structures that can be reached are the trochlea and superior oblique tendon. Varix near superior oblique tendon is removed by this technique. Careful handling of tissues will reduce the probability of postoperative restriction of superior oblique function. This technique allows good visualization of mass lesions lying above below or alongside the medial rectus muscle. Inferior oblique muscle may be needed to cut if it requires a greater exposure or there is need for placement of big implant for infero-medial fracture.

SUBCONJUNCTIVAL INTRACONAL APPROACH

In this approach, the conjunctiva is opened very close to corneal limbus in anterior aspect and medial rectus is detached from eyeball. Anterior lesions in anterior aspect of muscle cone are reached by entering the anterior orbit inside tenon capsule.

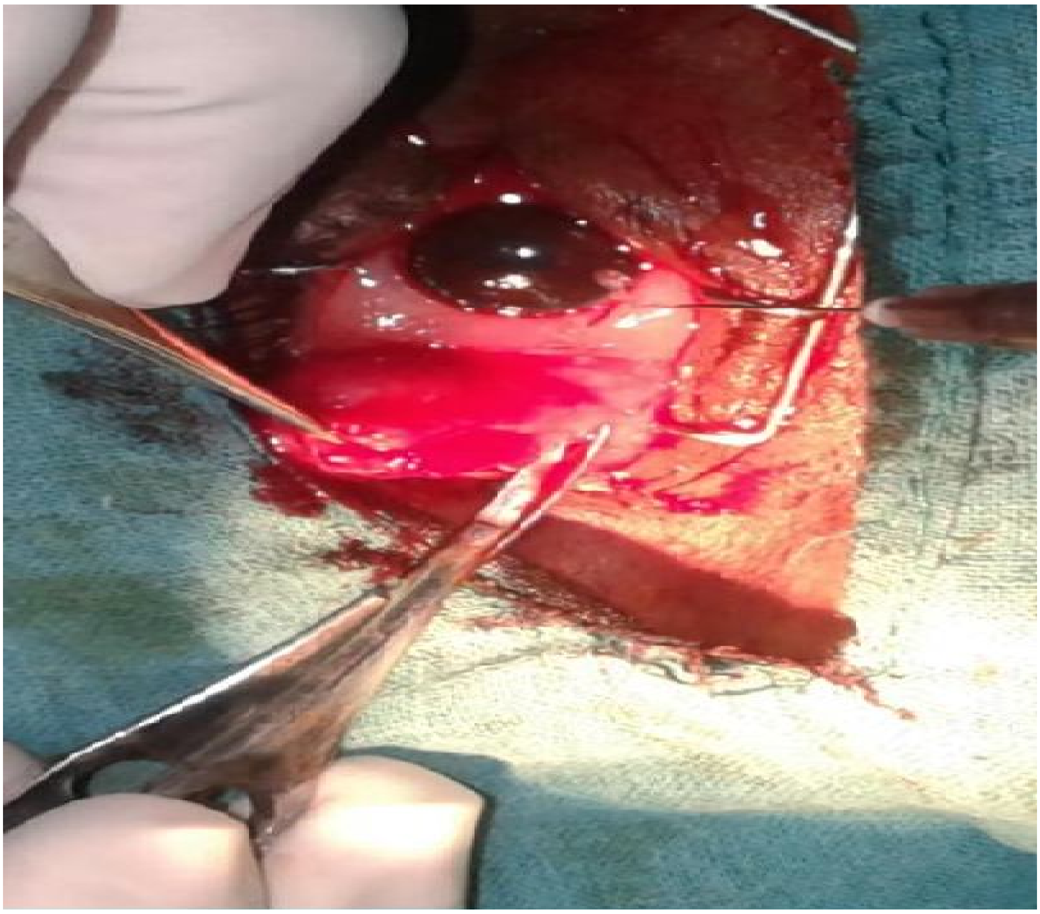


Fig 15: Medial trans caruncular approach for hamartoma excision

OPTIC NERVE SURGERY

The anterior optic nerve is accessed in this intraconal space by bluntly dissecting alongside the globe and gently teasing away from the nerve both the orbital fat (which in careful dissection will be somewhat encapsulated within tenon capsule) and adventitial fascia around the nerve which carries in it the ciliary arteries which are end arteries and should be carefully avoided. The greatest risk is that of damaging the central retinal artery. This end artery passes into the optic nerve on its ventral surface some 8-15mm posterior to the globe. Disruption of the central retinal artery will result in rapid and complete blindness. The mid portion of the optic nerve is more easily accessed via a eyelid crease incision.

SUPERIOR APPROACH

EYELID CREASE APPROACH

The superior orbit and orbital lobe of the lacrimal gland can be easily accessed through an eyelid crease incision[27]. The intraconal space is accessed by distracting the levator aponeurosis or occasionally by making a vertical incision through aponeurosis. The extraconal space above the superior rectus-levator complex is accessed directly. The frontal nerve can be identified and avoided. The lacrimal gland can be accessed directly for biopsy. The complete removal of the gland is more safely performed by removing the lateral wall of orbit.

Examples of intraorbital lesions that might be approached through crease incision include hemangioma and other benign tumors of the superior and anterior orbit, lacrimal gland,extraocular muscles or orbital tumor biopsy and superior orbital abscess drainage. If extra periosteal dissection is preferred,subocularis plane can be followed superiorly in the eyelid until the arcus marginalis of the superior orbital rim is achieved and then entry into the subperiorbital plane can be accomplished without opening the orbital septum or spilling orbital fat. It may be necessary to chip the superior orbital neurovascular bundle out of a canal in order to distract it for a wide dissection in the superior sub periorbital space. Dermoid cyst, mucocele and bony tumors or granulomas are examples of processes that might be approached through the eyelid crease in the superior sub periorbital plane.

Superolateral sub brow and coronal approach

A sub brow incision is less desirable cosmetically and should not be used unless anatomic features prelude the use of the eyelid crease. A coronal approach involves more dissection and leaves a scar that may become visible in a man with male pattern baldness, but provides superb access to the superior orbital rim and sub periorbital space.

Deeper or more infiltrative lesions in the superior orbit may be better exposed by removing and burring down a segment of the superior orbital rim[31]. The segment of the superior orbital rim that is anterior to the intracranial cavity is deeper than many surgeons realize in most cases, 10-12min of the superolateral bony rim can be excised without risk of intracranial entry. The frontal sinus occasionally aerates this region and may be entered, particularly if the bony rim excision is extended medially. The frontonasal duct remains intact, and simple bony closure with care taken to avoid incarceration or loculation of sinus mucosal spaces is necessary. Should the mucosa be opened, it will be necessary to exenterate the involved sinus and pack the frontonasal duct with grafts of muscle or fat. Consultation with pre-operative imaging studies will identify the position of the anterior cranial fossa and frontal sinus to aid in designing this bony incision.

THE INFERIOR APPROACH

TRANSCONJUNCTIVAL APPROACH WITH CANTHOLYSIS

The transconjunctival approach to the inferior and lateral orbit is extremely versatile and useful[27,32,33]. This incision allows rapid wide access to the intraperiorbital or extraperiorbital spaces, rim and zygoma and avoids the risk of eyelid retraction or lateral canthal; rounding that characterizes cutaneous approaches to the inferior orbit. The absence of a cutaneous scar is also a mild advantage, although a careful sub ciliary incision usually leaves a minimally noticeable scar.

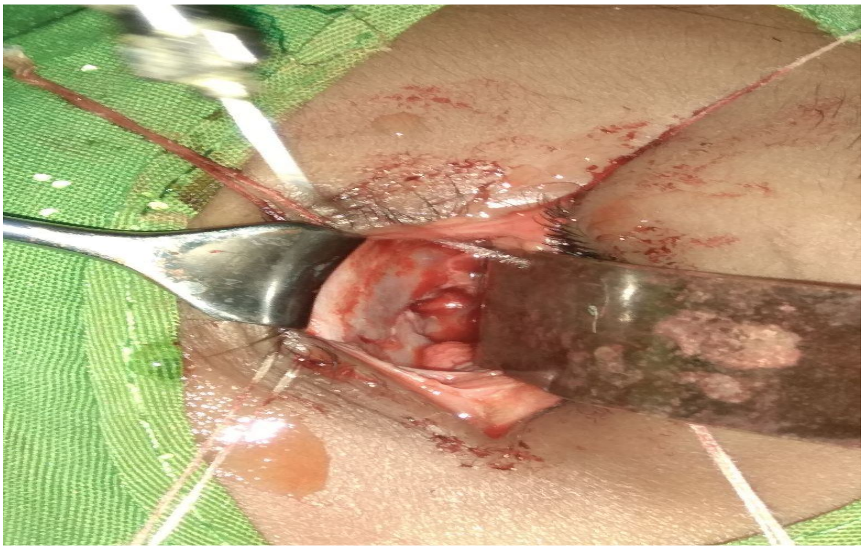


Fig. 16 Transconjunctival approach for blow out fracture repair

After cantholysis {which is not necessary in every case, particularly if the lower eyelid is lax} the eyelid is retracted away from the globe and scissors or cutting cautery are used to dissect through the conjunctiva and lower eyelid retractors to access the inferior orbital rim. The assistant holding the eyelid with a Desmarres retractor should be careful to hold the retractor against the anterior rim,to stretch the tissues over the bone and more importantly to protect the surgeon from inadvertently cutting through the septum and skin of the eyelid.once the arcus marginalis is exposed, the orbit can be entered either intraperiorbitally{for example to access an extraconal tumor} ie extraperiorbitally {to expose an orbital floor fracture or to decompress the orbital floor and medial wall}

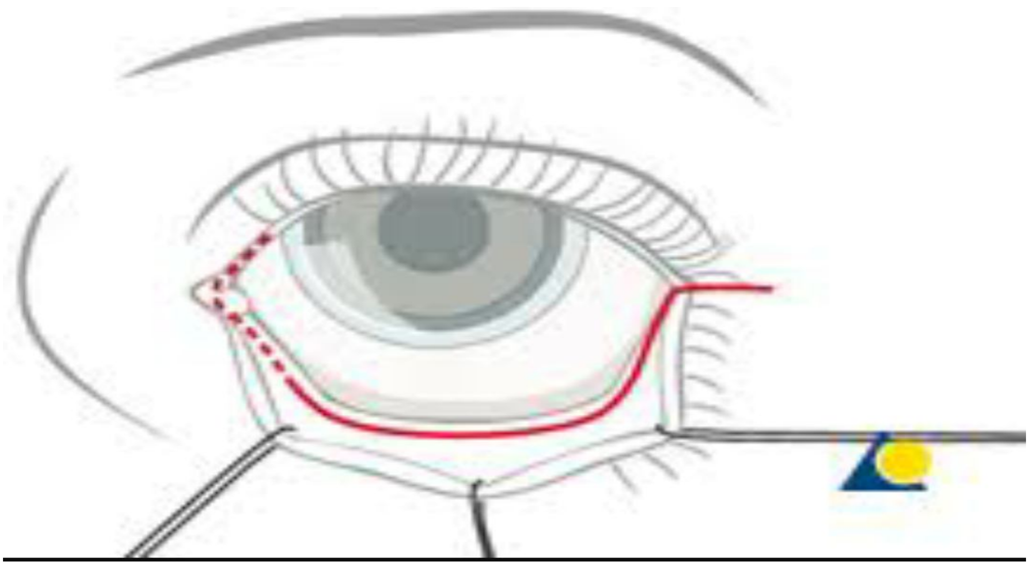


Figure. 17 Trans conjunctival approach to inferior orbit

EYELID APPROACH

The same surgical space in the inferior orbit from the inferior tip of the lacrimal gland to the lateral aspect of the lacrimal duct foramen can be accessed via acutaneous approach. Indications to approach this space cutaneously are extremely rare because of the great advantages of the conjunctival approach. The presence of severe conjunctival disease for example uncontrolled ocular cicatricial pemphigoid, might justify a cutaneous approach. Also the bones anterior to the lacrimal duct foramen are poorly accessed so that extensive orbital floor and rim fractures extending into the naso-orbital and ethmoidal region might be better approached through a cutaneous or combined conjunctival,sublabial ,and coronal approach.

A subciliary incision is designed 1-2mm below the eyelash line extending medially and laterally increases or relaxed skin tension lines as necessary. Dissection in the suborbicularis plane is employed until the orbital rim is reached and then subperiorbital entry into the orbit is obtained using a periosteal incision just outside the arcus marginalis followed by sub-periorbital dissection which lifts off the arcus marginalis and allows entry into the orbit. If care is taken to stay in a subperiosteal plane, no orbital fat is spilled ,and this represents one of the few advantages of a cutaneous approach over the conjunctival approach which does usually spill some fat anteriorly.

REMOVAL OF INFERIOR ORBITAL RIM(TESSIER)

In both the conjunctival or cutaneous approach to the inferior orbit, the orbital rim represents impediment to full visualization of the orbital apex and inferior orbital fissure. A useful manoeuvre to improve deep visualization of the inferolateral orbit in the extraperiorbital space is to dissect the anterior aspect of the inferior orbital fissure at the level of miller's vestigial muscle, using bipolar cautery, this approach provides good exposure of the inferior orbital apex. However, difficult cases, particularly tumors or trauma that extensively involve the posterior aspect of the inferior orbital fissure, pterygopalatine fossa, external outlet of foeamen rotundum,or palatine bone, may benefit from the additional exposure provided by removing the inferior orbital rim[34]. The inferior orbital neurovascular bundle can be spared by dissecting it out of its bony canal and displacing it.

The additional exposure of a sublabial approach can be extremely helpful, particularly in combination with a subconjunctival incision and allows anterior antrostomy for tumors involving more extensively the maxillary sinus or pterygopalatine fossa. Combined removal of the lateral wall and inferior orbital rim provides panoramic exposure of the inferolateral orbit and should be considered as another mode of access for extensive processes involving the inferolateral orbit and inferior orbital fissure

THE LATERAL APPROACH

Lesions in the anterior aspect of orbit such as anterior lacrimal gland pathologies or tumors which are below the lacrimal glandin the intra or extraconal space are approached securely and efficientlywithout bone removal by using the anterior orbitotomy approach. But certain deeper lesions which are present in the lateral aspect and posterior aspect of orbit such asorbital apex tumors, optic nerve tumors, lacrimal gland tumors usually require a bony lateral orbitotomy.[27, 35-38] Often combined approach is necessary, combining lateral approach with other approaches. for example, the lateral along with the medial orbitotomy for excellent exposure of the deep medial wall.

Fig. 18 Removal of cyst through lateral approach

Through a lateral crease incision, the lateral orbital rim is exposed. The sub periosteal dissection is made over the lateral orbital wall,temporalis fossa, and internal aspect of the lateral orbital wall. Metal retractors are used to protect the orbit and temporalis, saw is used to make osteotomies at zygomatic frontal suture just above the zygomatic arch. The lateral wall is fractured and removed using a drill, it is removed to complete bone flap. Bleeding is secured using bone wax. Bone cutting ronguers are sometimes used to remove posterior aspect of lateral wall to expose posterior part of orbit. Some cases may need exposure up to middle cranial fossa by removing bone lateral to superior orbital fissure[39].

Following bony flap, periorbita is exposed. It is split longitudinally on either side of lateral rectus muscle, the superior, lateral and inferior extraconal spaces and the entire intraconal space are thus visible. The next step is keeping the fat out of way. Fat is retracted out of field by cotton sponges and mild traction.

After the procedure, flap of bone is cleaned and repositioning is planned. The bone is repositioned either using sutures or mini plates. while making the bone flap, on either side of the saw cut, drill holes are made which is used later for passing surgical wired through it to fix the bone. Mini plates also make an excellent stabilisation tool for the lateral orbital rim. Mostly drains are not required.

COMPLICATIONS OF ORBITOTOMY

Although complications in orbital surgery are rarely encountered, care should be taken while handling numerous neurovascular structures, a scrupulous surgical technique is needed. Complications if any should be diagnosed early and treated early[27].

The deadliest complication of orbital surgery is visual loss. Various causes for visual loss following orbital surgery are optic nerve injury by inadvertent retractor use, too much pressure on globe, excessive cautery around the optic nerve and most important is causing damage to vascular supply of the globe. Improper control of bleeders / too long surgery may cause significant orbital edema or haemorrhage which in turn compromises the vascular supply to globe finally resulting in ocular ischemia and threat to visual loss. Expanding orbital haemorrhage is an emergency and needs prompt treatment with orbital decompression.

Another complication though rare but may occur is cerebrospinal fluid leak.it may occur with either medial orbital surgery of lateral orbital surgery.it case of medial orbital surgery it can occur due to damage to fovea ethmoidalis .in case of lateral orbital surgery it is due to damage to superior lateral wall. Small CSF leaks may be managed conservatively. Larger leaks need treatment. Fat, synthetic glues, dura suturing, or periosteal flaps are the methods of sealing CSF leaks[40]. Broad spectrum antibiotics are given to prevent infection.

One more complication though most of which are reversible is diplopia. Any surgery in and around extraocular muscles may cause damage to the muscles or their nerve supply resulting in diplopia. Usually the damage is temporary and reversible. Non-resolving diplopia may require strabismus surgery.

Eyelid complications may occur after orbital surgery. Upper lid complications like permanent or temporary ptosis, lower eyelid complications like ectropion, entropion, or epiblepharon can occur. If there is no improvement is noted in the follow up period over few months, surgical correction is to be considered.

Lacrimal complications due to lacrimal gland removal or injury during surgery can lead to dry eye. Epiphora can result from medial orbitotomy because of the surgical damage to nasolacrimal apparatus disrupting the outflow.

- Orbital emphysema
- Infection
- Wound dehiscence
- Hypoesthesia
- Vitreous haemorrhage
- Retinal detachment

AIM OF THE STUDY:

To evaluate the indications, surgical techniques and complications of orbitotomy.

OBJECTIVES:

- To analyse the incidence, indications, various clinical presentations, surgical approach and complications of orbitotomy.
- To assess the localization of the lesion and etiology.

MATERIALS & METHODS:

This descriptive study will be conducted at Orbit and Oculoplasty department, RIOGOH, Egmore, Chennai for a period of 6 months.

INCLUSION CRITERIA:

1. Patients requiring orbitotomy for diagnostic and therapeutic purposes will be included.
2. Patients presenting with trauma requiring orbitotomy
3. Inflammatory and infectious lesions requiring orbitotomy

EXCLUSION CRITERIA:

1. Neoplastic lesion with extensive invasion to adjoining structures
2. Neoplastic lesions with distant metastasis
3. Arterio venous malformations

SCREENING PROCEDURES/ VISITS:

Visual acuity, refraction,

Examination of the orbit, eyelids,

Extraocular movements

Slit lamp examination,

Direct and indirect ophthalmoscopy

Intraocular pressure,

Fields,

Colour vision,

Hertel's exophthalmometry,

Forced duction test,

Examination of proptosis,

Complete hemogram, peripheral smear,

Mantoux, chest X ray

Thyroid function test,

Fasting and PP blood sugar,

Urine routine examination,

Fine needle aspiration cytology,

Excision biopsy for histopathological examination,

Computed tomography,

Magnetic resonance imaging,

Ultrasound B- scan of orbit,

Doppler study,

Angiography.

Follow up Procedures / Visits:

1st, 2rd, 4th week, 3rd, and 6 th month

ASSESSMENTS OF PARAMETERS :

Improvement in proptosis

Improvement invisual acuity

Extra ocular movements

Pupil reaction

Fields

Colour vision

RESULTS AND ANALYSIS

AGE DISTRIBUTION

Age group	No. of cases	% of total cases
1-10 yrs	6	20
11-20 yrs	9	30
21-30 yrs	7	23.3
31-40 yrs	2	6.7
41-50 yrs	1	3.3
51-60 yrs	2	6.7
Above 60 yrs	3	10
Total	30	100

Table 1: Age distribution in the study group

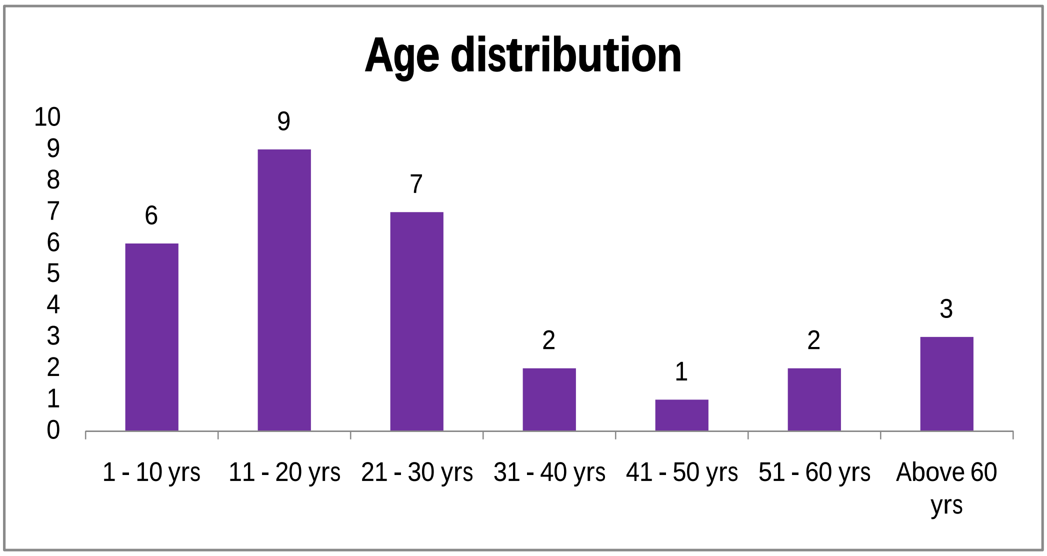


Chart 1: Age distribution in the study

In this study the common age group who underwent orbitotomy is 11-20 yrs (30%), followed by 21- 30 yrs (23.3%). Majority of the cases, 73.3% were below the age of 30.

SEX DISTRIBUTION

Sex	No. of cases	% of cases
Male	16	53.3
Female	14	46.7
Total	30	100

Table 2: Sex distribution in the study group

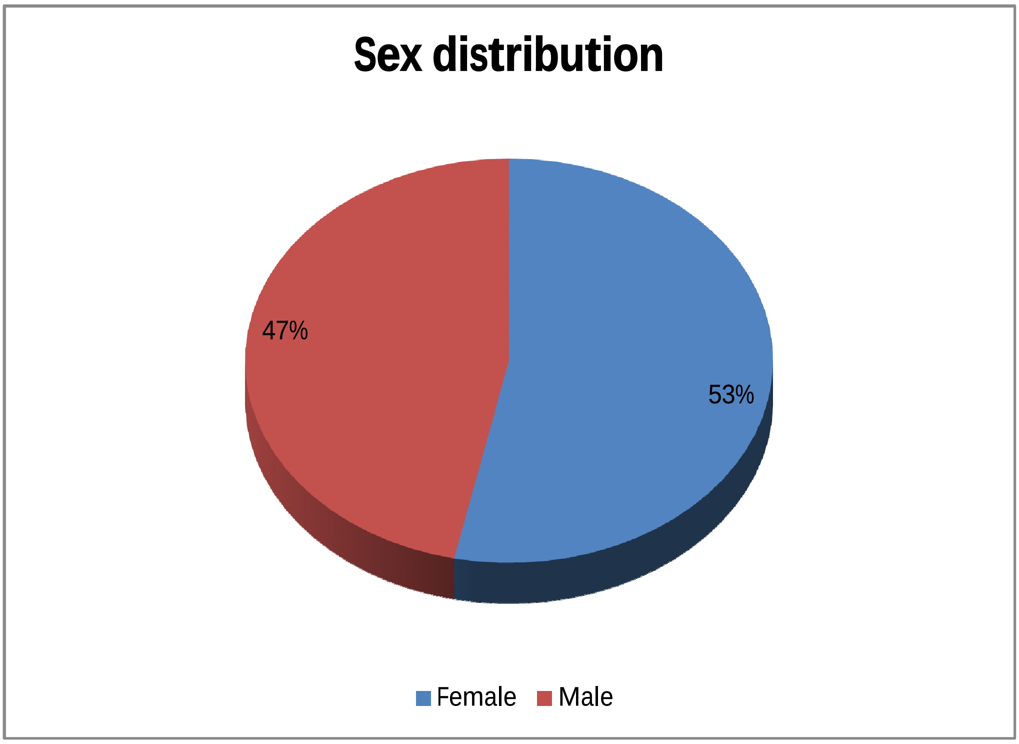


Chart 2: Distribution of sex in the study group

Of the patients who underwent orbitotomy majority was males (53%) and females were 47%

LATERALITY OF THE EYE IN THE STUDY GROUP

Laterality	No. of cases	% of cases
Right	16	53.3
Left	14	46.7
Total	30	100

Table 3: laterality of the eye in the study group

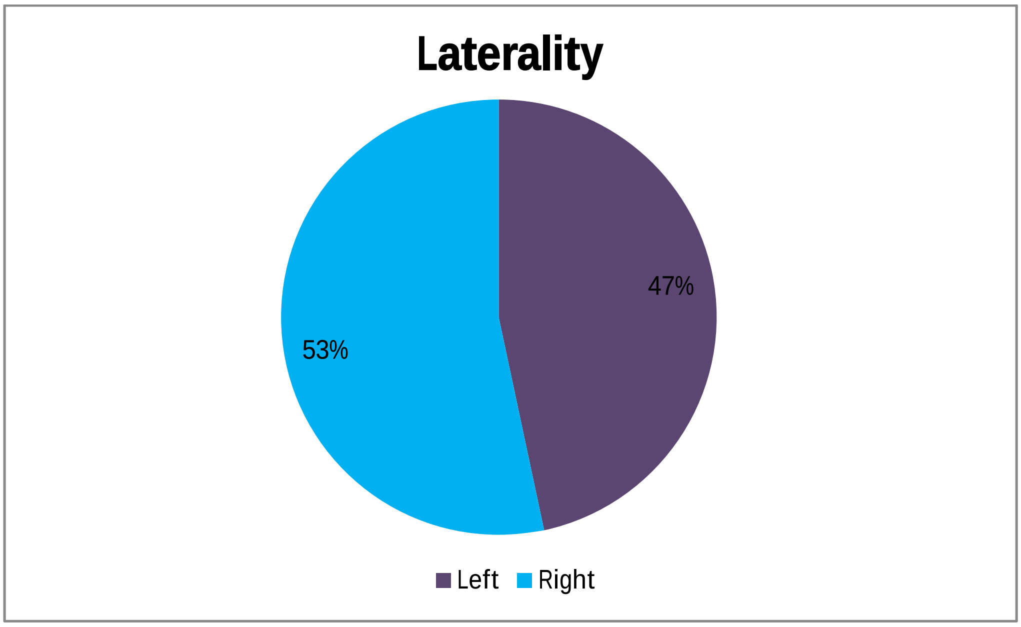


Chart 3: laterality of the eye in the study group

For most of the patients studied in the group, orbitotomy was done for the right eye 53% and left eye was operated in 47%

VISUAL ACUITY AT THE TIME OF PRESENTATION:

Visual acuity	No. of cases	% of total
FL	2	6.7
R6/6, L6/6	20	66.7
R6/12, L6/12	3	10
R6/18, L 6/18	3	10
R6/24, L6/24	1	3.3
R6/36, L6/36	1	3.3
Total	30	100

Table 4: Visual acuity at the time of presentation

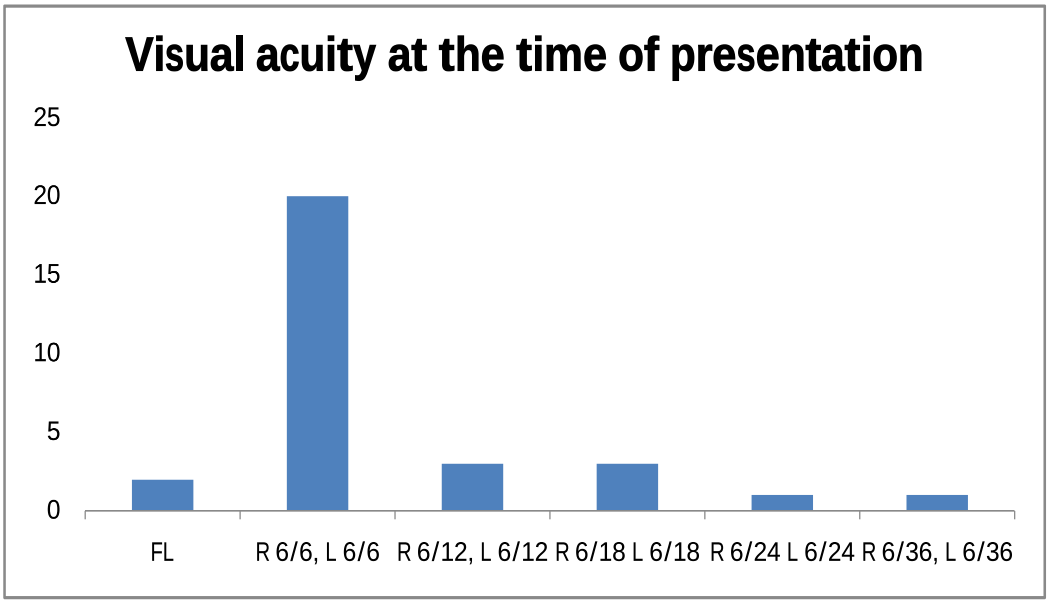


Chart 4: Visual acuity at the time of presentation

Most of the patients had good visual acuity at presentation. 66.6% had a vision of 6/6 in both eyes. 3 patients had 6/12 vision in both eyes and 3 other patients. Only 2 patients had a vision less 6/24 which was due to cataractous changes.

PRESENTING COMPLAINTS OF THE PATIENTS:

Presenting complaint	No. of cases	Percentage
Diplopia	6	20
Proptosis	5	16.7
Swelling	19	63.3
Total	30	100

Table 5: Presenting complaints of the patients in the study group

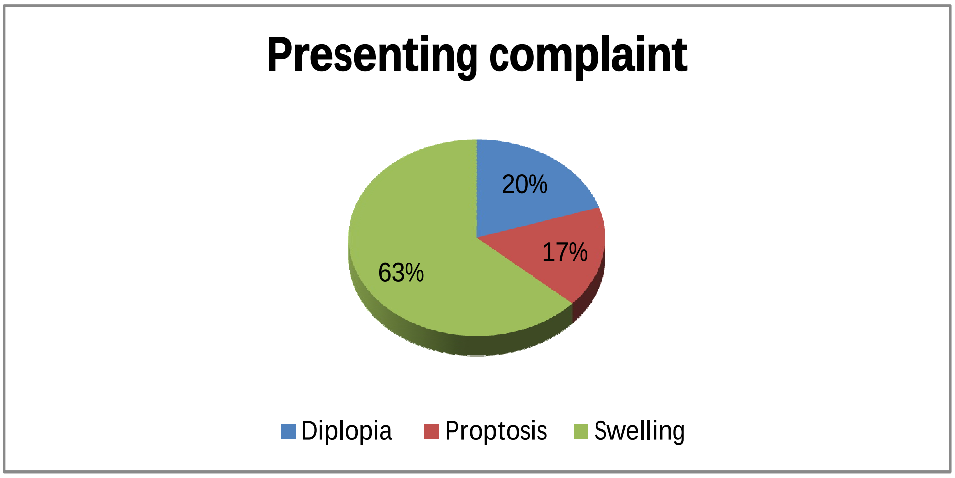


Chart 5: Presenting complaint of patients in the study group

In the study group most of the patients presented with swelling (63%), 20 % presented with diplopia and 17% presented with proptosis.

Patients diagnosed to have dermoid, lipoma, hamartoma presented with complaints of swelling. Whereas 6 blowout fracture patients complained of diplopia in upgaze. And 3 patients of lymphoma, 1 infective cyst, 1 cavernous hemangioma had complaints of proptosis of involved eye.

ANALYSIS OF INVESTIGATIONS:

Investigations	No. of cases	Percentage
Biopsy	2	6.7
CT	24	80
CT with biopsy	2	6.7
CT and MRI	1	3.3
MRI	1	3.3
Total	30	100

Table 6: Analysis of investigations done for the patients in the study group

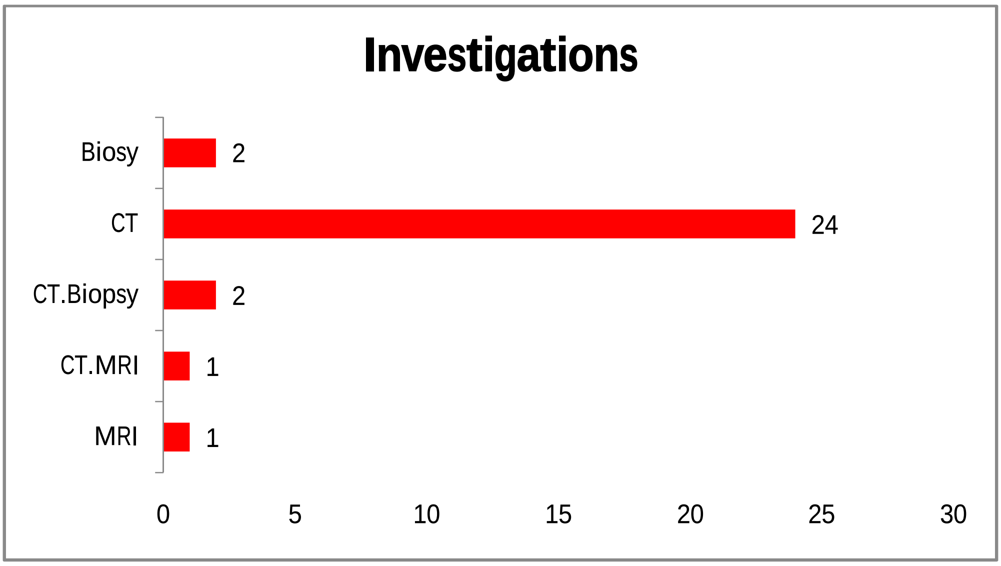


Chart 6: Analysis of investigations done for the patients in the study group

Computed tomography of the orbit was the most common investigation done for the patients in the study group (80%). 1 patients required CT and MRI. In 2 patients CT and biopsy was done. Excision biopsy was also done for hamartoma and infective cyst. CT scan and MRI played a major role in localizing the lesion and planning the approach. CT was particularly useful in blow out fractures to analyze the size and location of the defect and to decide upon the management and implant to be used. Histopathological examination helped in confirmation of diagnosis.

ANALYSIS OF THE DIAGNOSIS

Diagnosis	No. of cases	Percentage
Blow out fracture	6	20
Cavernous hemangioma	1	3.3
Dermoid	15	50
Hamartoma	1	3.3
Infective cyst	1	3.3
Lipoma	2	6.7
Lymphoma	3	10
Retention cyst	1	3.3
Total	30	100

Table 7: Analysis of the diagnosis of the patients

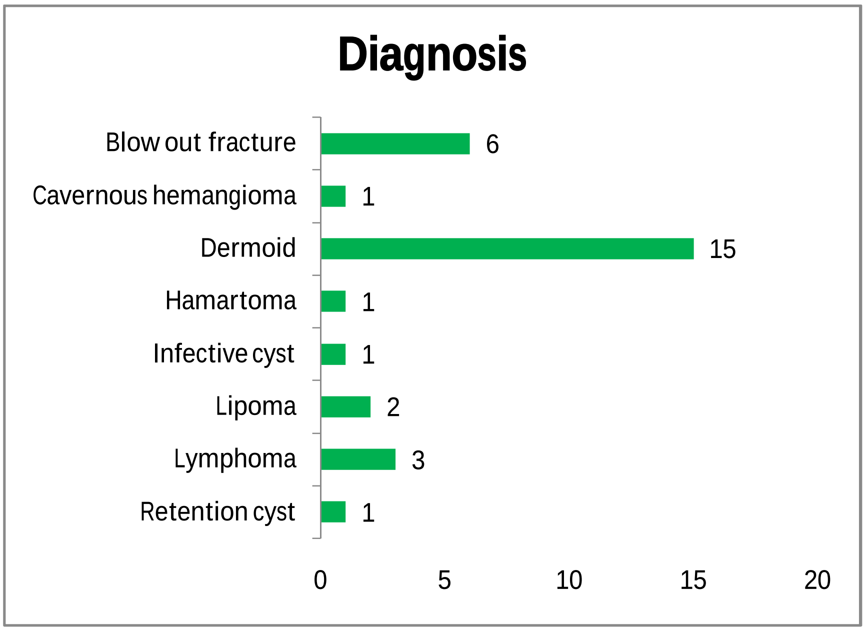


Chart 7: Analysis of the diagnosis of the patients

Of the 30 cases who underwent orbitotomy majority of the patients was diagnosed with dermoid cyst (15), most of whom underwent medial orbitotomy. 6 patients underwent inferior orbitotomy for blow out fracture. 3 patients were suffering from lymphoma all of whom underwent lateral orbitotomy and 2 was diagnosed as lipoma.

Fig 19: congenital dermoid cyst with CT scan

SPECIALITY CLINIC REFERRALS

Specialty clinic referrals	No. of cases	Percentage
DM	1	3.3
ENT	1	3.3
GP	1	3.3
OMFS	6	20
Nil	21	70
Total	30	100

Table 8: Patients who needed speciality clinic referral.

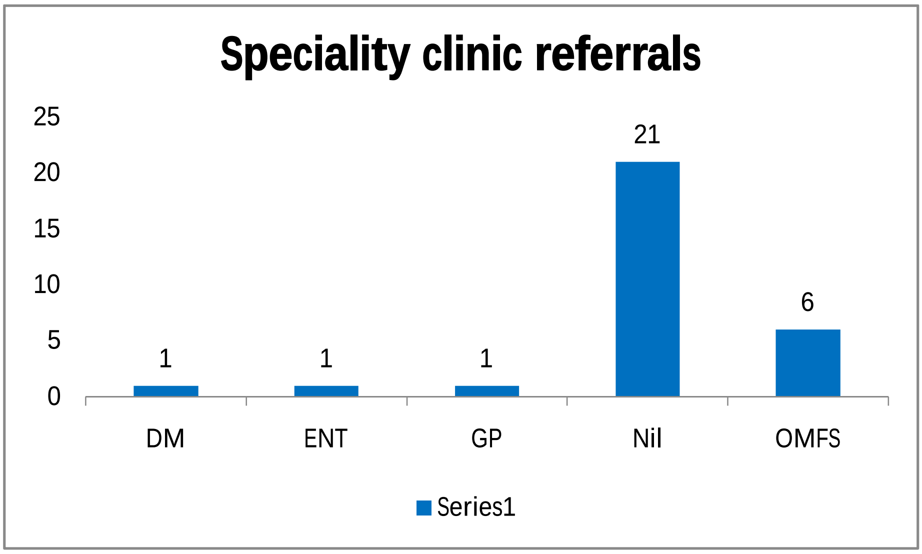


Chart 8: Patients who needed specialty clinic referral.

In the study most of the patients did not need any other specialty referral (70%). 6 patients of blow out fractures required OMFS opinion for multidisciplinary approach. 1 patient a case of cavernous hemangioma was referred for ENT for endonasal approach. Diabetology and general physician opinions were obtained for systemic control of Diabetes and hypertension pre operatively.

ANAESTHESIA FOR ORBITOTOMY:

Type of anaesthesia	No. of cases	Percentage
General anaesthesia	15	50
Local anesthesia	15	50
Total	30	100

Table 9: Type of anaesthesia given for orbitotomy

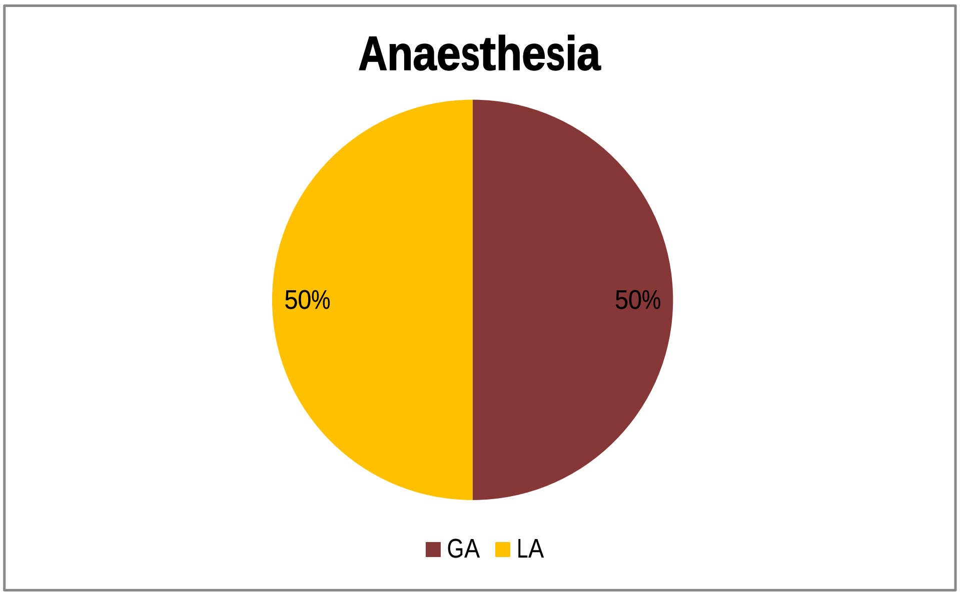


Chart 9: Type of anaesthesia given for orbitotomy

It was found in the study that half of the patients needed general anaesthesia (50%) and another half required local anaesthesia. Paediatric patients, patients with poor cooperation, long surgeries and deeper lesions were considered for general anaesthesia.

APPROACHES FOR THE ORBITOTOMY

Approach	No. of cases	Percentage
Anterior orbitotomy	2	6.7
Inferior orbitotomy	6	20
Lateral orbitotomy	7	23.3
Medial orbitotomy	14	46.7
Trans nasal	1	3.3
Total	30	100

Table 10: Analysis of various approaches for the orbitotomy

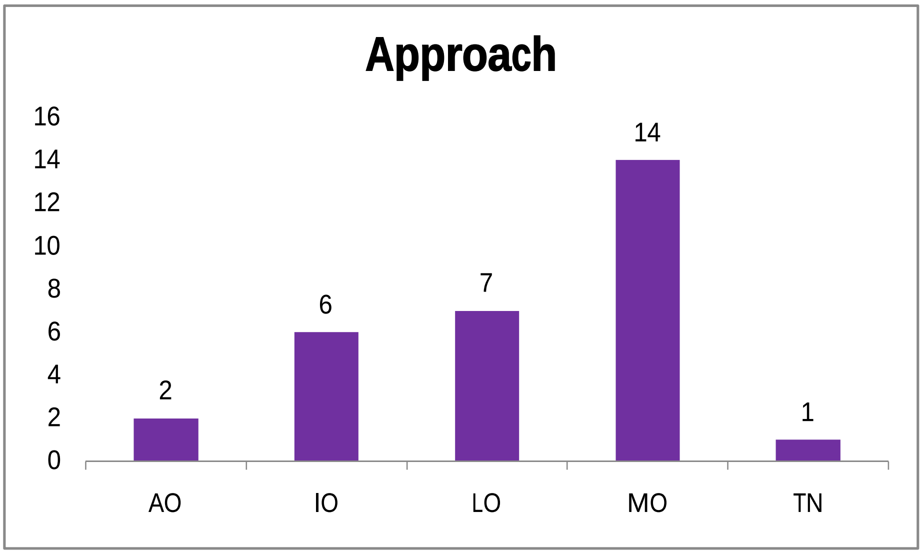


Chart 10: Analysis of various approaches for the orbitotomy

Most (46.7%) of the patients in the study group underwent medial orbitotomy. Second commonly done orbitotomy done in the study is lateral orbitotomy. 6 patients underwent inferior orbitotomy for blow out fracture.

ANALYSIS OF VARIOUS INCISION TYPES:

Incision type	No. of cases	Percentage
Trans cutaneous	19	63.3
Trans conjunctival	9	30
Sub ciliary	1	3.3
Trans nasal	1	3.3
Total	30	100

Table 11: Analysis of the various incision types in orbitotomy

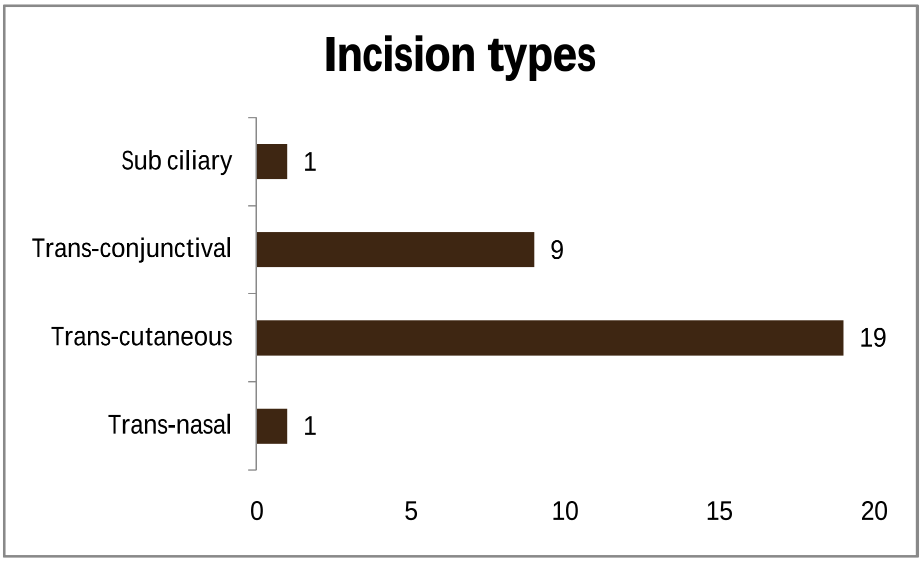


Chart 11: Analysis of the various incision types in orbitotomy

In the study group of 30 patients most of the patients were approached for orbitotomy in trans cutaneous route(63.3%) second common type of incision made was trans conjunctival incision. Subciliary incision was made in 1 blowout fracture patient. Trans nasal endoscopic approach was used in 1 patient of Cavernous hemangioma.

MODE OF INJURY IN CASES OF BLOW OUT FRACTURE:

Mode of injury	No. of cases	Percentage
Assault with fist	1	16.7
Blunt injury with ball	3	50
Road traffic accident	2	33.3
Total	6	100

Table 12: Modes of injury for blow fracture cases

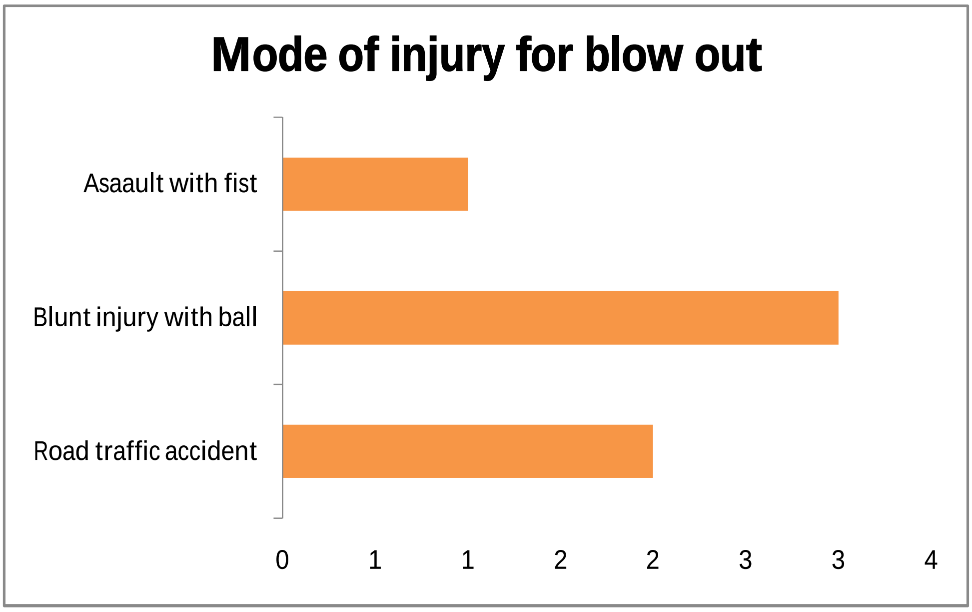


Chart 12: Modes of injury for blow fracture cases

Blunt injury with ball (50%) while playing was found to be the most common cause of injury in the 6 patients who suffered blow out fracture followed by Road traffic accident 33.3%. 1 case also reported with history of assault with fist.

ANALYSIS OF THE TYPE OF IMPLANTS USED FOR BLOW OUT FRACTURE REPAIR:

Implant used	No.of cases	Percentage
No implant	2	33.3
Auricular cartilage	2	33.3
Titanium mesh with screws	2	33.3
Total	6	100

Table 13: Analysis of mode of injuries in blow out fracture

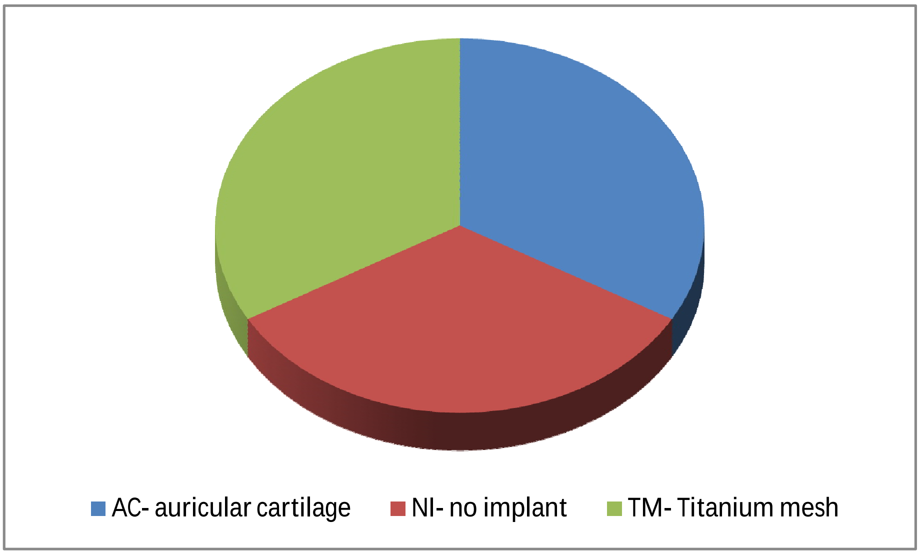


Chart 13: Analysis of mode of injuries in blow out fracture

Of the 6 cases of blow out 2 patients were treated with inferior rectus muscle entrapment release only with no implants as they were trap door fracture in patients of paediatric age group, 2 patients were treated with inferior muscle entrapment release with floor strengthening by auricular cartilage and 2 more with titanium mesh based on their defect type, location and size.

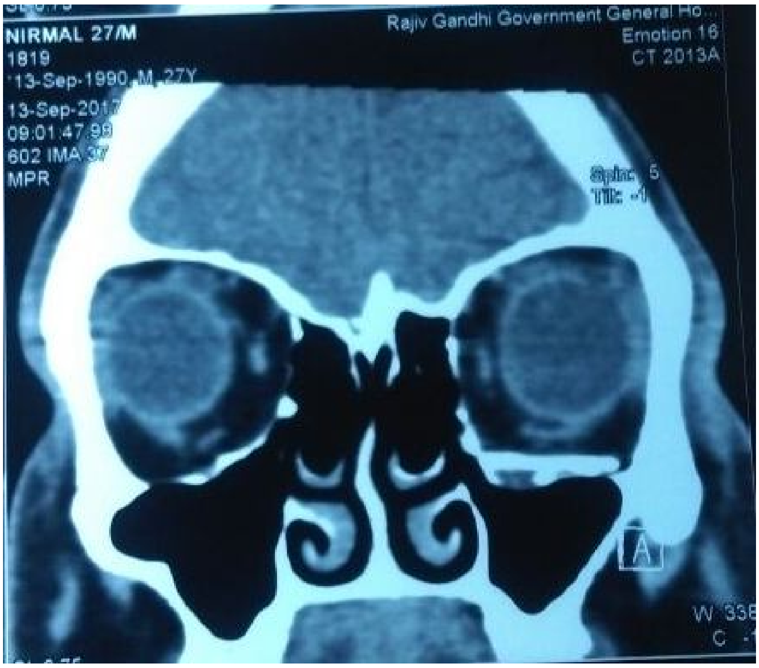


Fig 20: CT Showing titanium mesh with screws for blow out

COMPARISON OF PRE OPERATIVE AND POST OPERATIVE EOM:

Pre op EOM	No. of cases	Percentage
Adduction restriction	1	3.3
Depression restriction	1	3.3
Elevation restriction	6	20
Full	22	73.3
Total	30	100

Table 14: Pre operative EOM of the study group

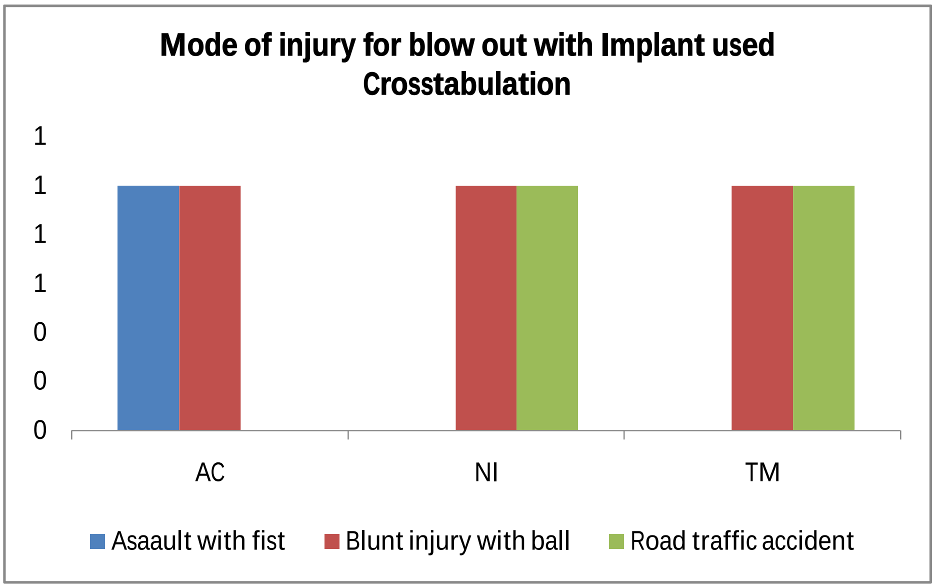


Chart 14: Implant used vs mode of injury

Post op EOM	No. of cases	Percentage
Elevation restriction	2	6.7
Full	28	93.3
Total	30	100

Table 15: Post operative EOM of the study group

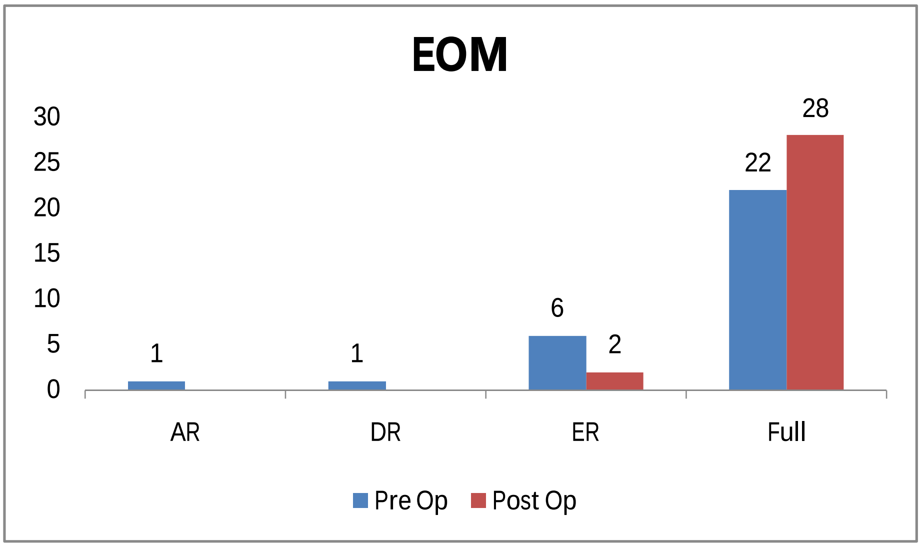


Chart 15: Comparison of pre and post operative EOM

Most of the patients had no EOM dysfunction in the study group pre- operatively. Blow out fracture (20%0 had elevation restriction, 1 patient had adduction restriction due to hamartoma in medial canthus and 1 patient had depression restriction due to an infective cyst. Of the total 8 cases with EOM restriction pre operatively only 2 patients had post-operative elevation restriction, both were blow out fractures.

INTRA OPERATIVE COMPLICATIONS:

Intra op complications	No. of patients	Percentage
Hemorrhage	2	6.7
Conjunctival button hole	1	3.3
Nil	27	90
Total	30	100

Table 16: Intraoperative complications of orbitotomy

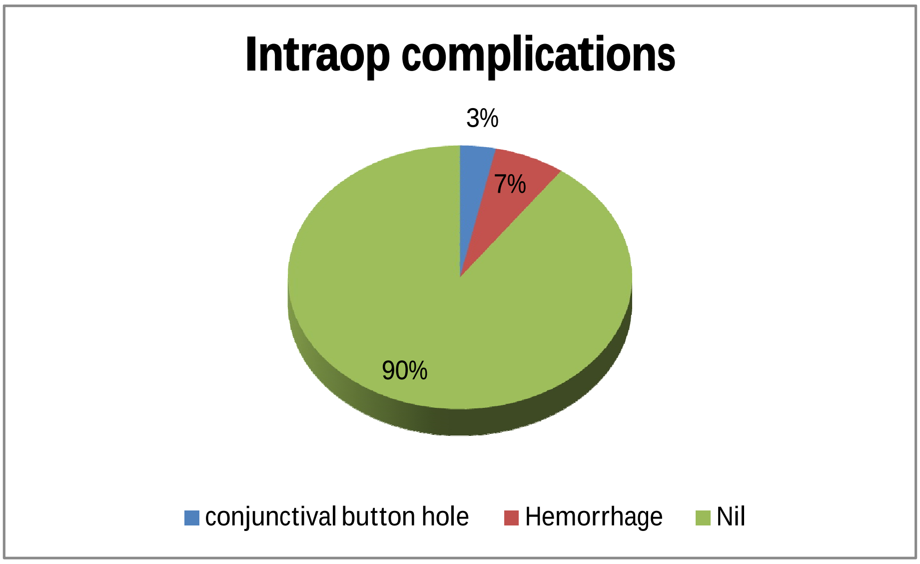


Chart 16: Intraoperative complications of orbitotomy

Most of the orbitotomies (90%) done in the study group were uneventful with no intra operative complication. 7% had intra operative hemorrhage while doing orbitotomy for hamartoma and a dermoid. 1 case of blow out fracture had a full thickness button hole in the lower lid during surgery with electro cautery in conjunctival approach

POST OPERATIVE COMPLICATIONS:

Post op complications	No. of cases	Percentage
Elevation restriction	2	6.7
Scar	20	66.7
Nil	8	26.7
Total	30	100

Table 17: Post operative complications of orbitotmy

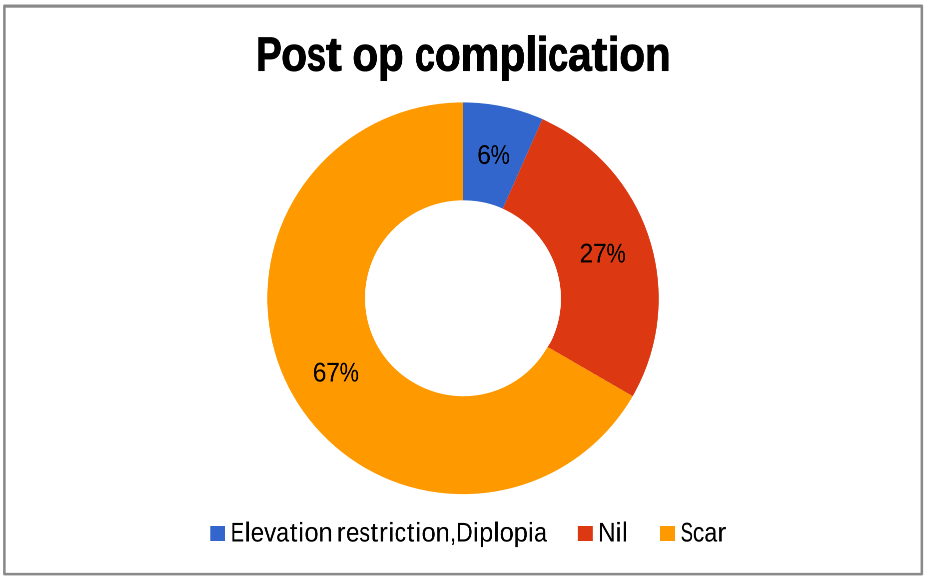


Chart 17: Post operative complications of orbitotomy

In the study most common post-operative complication was scar due to trans cutaneous approach of orbitotomy. 2 patients of blow out fracture had residual elevation restriction and diplopia in upgaze. Most of the patients had no significant post op complications.

POST OPERATIVE VISION:

Visual acuity	No. of cases	% of total
FL	2	6.7
R6/6, L6/6	20	66.7
R6/12, L6/12	3	10
R6/18, L 6/18	3	10
R6/24, L6/24	1	3.3
R6/36, L6/36	1	3.3
Total	30	100

Table 18: Post operative visual acuity

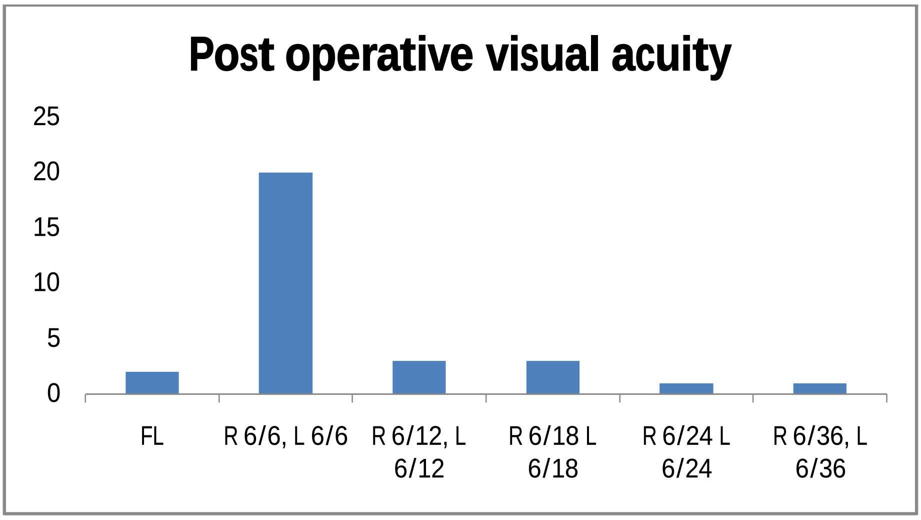


Chart 18: Postoperative visual acuity

66.6% had a vision of 6/6 in both eyes. 3 patients had 6/12 vision in both eyes and 3 other patients. No patient had a drop in vision post operatively.

DISCUSSION

A study conducted by Brett. W. Davies et al on transconjunctival incision discussed the indications and complications of it. They concluded that transconjunctival approach provides good surgical exposure to the inferior orbit. It was also found that this approach is associated with a low complication rateand a better aesthetic outcome than transcutaneous approaches. When combined with a lateral canthotomy there will be wide access to the orbital floor and lateral orbital wall. These results are similar to ours.[13]

A study conducted in Guntur medical college on surgical excision of dermoid by orbitotomy. There were 4 types of orbitotomy done in the study; anterior orbitotomy, lateral orbitotomy, trans frontal orbitotomy and temporofrontal orbitotomy. They concluded that there was no vision threatening complications due to optic nerve damage or lagophthalmos or exposure keratopathy. In our study also there was no complications with dermoids operated in the study[25].

A study was conducted on purely endoscopic trans nasal removal of cavernous hemangioma in the orbit and they concluded that the endoscopic management of intraconal cavernous haemangiomas is a feasible and safe alternative. We have also reported a case of cavernous hemangioma managed via trans nasal endoscopic approach where complete resection of tumor with no complication was possible.[17]

A retrospective, descriptive study on lateral canthotomy orbitotomy in which 18 patients were included was conducted and the results were that this approach is a rapid, safe, and minimally disruptive approach for pathology in the lateral orbit and optic nerve. No bone is removed, and in the post-operative period recovery is rapid with minimal inflammation or chemosis. In our study also lateral orbitotomy was done for lymphomas with complete removal of the tumor without need for bone removal and with no significant complication in the post operative period.[11]

A study conducted in China by Sun F et al on Surgical treatment of blow out fracture in 52 patients reported that the diplopia completely disappeared in 18 cases and partly disappeared in 25 cases after operation. Diplopia was still presented in 9 cases post-operatively. There were 4 cases with inferior orbital nerve anesthesia after operation. They concluded that the effect is related to the time of presentation for surgery. Transconjunctival approach has advantages of easy operation, good exposure and invisible scar. In our study also 2 patients had post operative diplopia as the surgery was done after 2 weeks of trauma for them.[26]

SUMMARY

30 Patients who underwent orbitotomy in the department of Orbit and Oculoplasty Services in RIOGOH in a period of 6 months were analysed.

The analysis included the indications, approaches, incisions and complications of orbitotomy. The findings of the analysis are as follows:

- Most common age group for which orbitotomy in this study belonged to the age group between 11 and 20 years (30%).
- In the study orbitotomy was most commonly done in male patients (53.3%) more than female patients.
- Orbitotomy was commonly done in right eye more than left eye in the study. 53% of the patients were operated in the eye.
- Most of the patients in the study were having good visual acuity at presentation and only 3.3% of patients had vision worse than 6/18.
- Most of the pathology was diagnosed with the help of computed tomography of orbit in the study. For soft tissue lesions like hemangioma MRI was better. 24 patients out of the 30 patients in the study group needed CT scan for the diagnosis.

- In this study most common indication for orbitotomy (50%) was congenital dermoid cyst followed by blow out fracture (20%).
- Most of the patients were managed in ophthalmology department. 6 patients of Blow out fracture repair needed a combined effort with Oro maxillo facial surgeons and 1 cavernous hemangioma patient needed a multidisciplinary approach with the help of ENT.
- Both general and local anaesthesia was equally used in the study.
- Most common approach in the study was medial approach (46.7%) followed by lateral orbitotomy.
- Most of the incisions made in the study were trans cutaneous (63.3%) followed by trans conjunctival (30%).
- There was no intra operative complications in majority of the cases in the study. Only in two cases intra operative haemorrhage was noted.
- Most common post operative complication in the study was scar as most of the incisions for orbitotomy were trans cutaneous in the study.

- Commonest mode of injury in blow out fracture was blunt injury with ball in our study. 3 of the 6 patients of blow out fracture gave history of blunt injury with ball.
- Implant used in blow outs were auricular cartilage in 2 patients, titanium mesh with screws in 2 patients and entrapment release only in 2 patients of the 6 patients of blow out fracture.
- In this study of the 8 patients who suffered EOM dysfunction pre operatively only 2 patients had post operative restriction of movements. Both the patients were cases of blow out fracture.
- None of the patient in the study had decrease in visual acuity following orbitotomy in the study.

CONCLUSION:

- This study revealed that the most common indication for orbitotomy is dermoid cyst followed by blow out fracture in the younger age group and lymphoma in the older age group. Overall dermoid remained the most common indication for orbitotomy.
- CT scan was the best modality of investigation in most of the cases in this study to diagnose the lesions within the orbit, to identify the extent of lesion and in planning the further management.
- In this study, most common approach was medial orbitotomy and most common incision made was transcutaneous.
- Among the patients of blow out fracture, most common mode of injury was blunt injury with ball, implants were decided based on the size and location of defect.
- Most common intra operative complication was haemorrhage and most common postoperative complication was scar.
- There was no drop in the vision in any of the patient post operatively in the study group.

The exact early diagnosis and timely referral to expert orbital surgeon is mandatory for best results. Early intervention in cases of blow out fracture had better outcome post operatively. Transconjunctival incision had lesser incidence of postoperarive complications and better cosmetic acceptance.

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PROFORMA

NAME :

AGE/SEX :

O.P/I.P NO :

COMPLAINTS:

History of presenting illness:

Age of onset

Mode of onset: sudden/gradual

Duration: acute/chronic

Laterality: unilateral/bilateral

Variability with cough/posture/valsava maneuver/crying/sneezing

H/O Pain: onset/nature/progression/severity/aggravating and reliving factors

H/O Defective vision/colour vision/field of vision/diplopia

H/O Fever/loss of weight/headache/vomiting/loss of consciousness

H/O Trauma

H/O ENT discharge, blockage of nose

H/O Bleeding gums/epistaxis/ skin rash

H/O Thyroid symptoms like palpitation, tremors, weight loss or gain, skin changes, constipation, intolerance to heat or cold

PAST HISTORY:

H/O Similar episodes

H/O TB/Malignancy

H/O Thyroid/ENT problem

H/O Any ocular surgery

PERSONAL HISTORY:

Vegetarian/non-vegetarian

Birth history-birth trauma/mode of delivery

FAMILY HISTORY:

TB/Thyroid disorder/Malignancy

Any similar problems in the siblings or other family members

TREATMENT HISTORY:

Medical/surgical/chemotherapy/radiotherapy/others

General Examination:

Consciousness

Built-well/moderate/ill

Nourishment - well/moderate/ill

Pallor/icterus/cyanosis/clubbing/lymphadenopathy

VITALS:

PR/BP/RR/Temp

LOCAL EXAMINATION:

Head posture, Facial asymmetry

RIGHT EYE	EXAMINATION	LEFT EYE
	VISUAL ACUITY	
	EYELIDS	
	EXTRAOCULARMOVEMENTS	
	CONJUNCTIVA	
	CORNEA	
	ANTERIOR CHAMBER	
	IRIS	
	PUPIL	
	LENS	
	PROPTOSIS	
	AXIAL/ECCENTRIC	
	COMPRESSIBILITY	
	RESISTANCE TO RETROPULSION	
	VALSALVA MANEUVRE	
	PULSATIONS	
	ORBITAL MARGINS	
	TENSION	
	FIELDS	
	EXOPHTHALMOMETER	
	FORCEDDUCTION TEST	
	FUNDUS	

Other system examinations:

CVS/RS/ABDOMEN/CNS

OTHER CONSULTATIONS:

Paediatrics/Haematology/ENT/Neurology/Endocrinology/Radiology/Oncology

PROVISIONAL DIAGNOSIS:

INVESTIGATIONS:

LABORATORY:

HB%/TC/DC/PLT/ESR/CRP, Mantoux

Peripheral smear, Bone marrow examination

Urine albumin/sugar, Serum free T3,T4,TSH

RADIOLOGICAL:

Plain X-ray orbit/ sinuses /optic foramen/skull/chest etc

A-Scan,B-Scan, USG abdomen/head&neck

MRI/CT scanorbit/brain/sinuses(plain/contrast)

Orbital venogram

BIOPSY:

BMA/ FNAC/ Incisional/ Excisional

HPE Report, Flowcytometry

FINAL DIAGNOSIS:

TREATMENT:

FOLLOWUP PERIOD AND ADVICE:

INDEX TO MASTER CHART:

1. S. No- Serial number
2. Name
3. Age
4. Sex: M- Male, F- Female
5. Id No
6. Eye: RE- Right eye, LE- Left eye
7. Vision: R- Right eye, LE- left eye, FL- fixing and following light
8. Sign: S- Swelling, P- Proptosis, D- Diplopia
9. Mode of injury: NA- Not Applicable, RTA- Road Traffic accident, AF- Assault with fist, BIB- blunt injury with ball
10. Investigations: CT- Computed Tomography, MRI- Magnetic Resonance Imaging, B- Biopsy
11. Diagnosis- DE- Dermoid, LY- Lymphoma, BOF- Blow out fracture, HA- Hamartoma, IC- Infective cyst, LI- Lipoma, RC- Retention cyst, CH- Cavernous Hemangioma
12. Speciality clinic referrals- DM- Diabetology, GP- General physician, OMFS- Oro maxillo facial surgeon, ENT- Otorhinolaryngology
13. Anaesthesia- GA- General Anaesthesia, LA- Local Anaesthesia

14. Approach- MO- Medial orbitotomy, LO- Lateral orbitotomy, IO- Inferior orbitotomy, AO- Anterior orbitotomy, TN- Trans nasal
15. Incision: Tcut- Trans-cutaneous, TC- Transconjunctival, SC- Subciliary, TN- trans nasal
16. Implants: NA- Not applicable, NI- No implant, AC- Auricular cartilage, TM- titatium mesh
17. Pre-Operative EOM: EOM- Extra ocular movements, F- Full, ER- Elevation restriction, AR- Adduction restriction, DR- depression restriction
18. Post-operative EOM- EOM- extra ocular movements, F- Full, ER- Elevation restriction,
19. Intra-operative complications: H- Hemorrhage, CB- Cautery burn
20. Post-operative complication: SC- Scar, ER- Elevation restriction, D- Diplopia

MASTER CHART

S. No	Name	Age	Sex	Id no.	Eye	Vision	complaint	Mode of injury for blow out	Investigation	Diagnosis	Speciality clinic referrals	Anaesthesia	Approach	Incision	Implant used	Pre op EOM	Post op EOM	Intraop complications	post op complication	post op vision
1	CATHERINE MARY	18	F	568974	RE	R 6/6, L 6/6	S	NA	CT	DE	Nil	LA	MO	Tcut	NA	F	F	H	SC	R 6/6, L 6/6
2	SIVA RANJINI	22	F	598671	LE	R 6/6, L 6/6	S	NA	CT	DE	Nil	LA	MO	Tcut	NA	F	F	Nil	SC	R 6/6, L 6/6
3	EZHUMALAI	21	M	586942	LE	R 6/6, L 6/6	S	NA	CT	DE	Nil	LA	MO	Tcut	NA	F	F	Nil	SC	R 6/6, L 6/6
4	MANJU SRI	2	F	567183	LE	FL	S	NA	CT	DE	Nil	GA	MO	Tcut	NA	F	F	Nil	SC	FL
5	RAKESH	5	M	569317	RE	R 6/6, L 6/6	S	NA	CT	DE	Nil	GA	LO	Tcut	NA	F	F	Nil	SC	R 6/6, L 6/6
6	RANJINI	19	F	578963	RE	R 6/6, L 6/6	S	NA	CT	DE	Nil	LA	MO	Tcut	NA	F	F	Nil	SC	R 6/6, L 6/6
7	ARCHANA	8	F	574631	LE	R 6/6, L 6/6	S	NA	CT	DE	Nil	GA	MO	Tcut	NA	F	F	Nil	SC	R 6/6, L 6/6
8	SHANKAR	40	M	583691	RE	R 6/12, L 6/12	S	NA	CT	DE	Nil	LA	MO	Tcut	NA	F	F	Nil	SC	R 6/12, L 6/12
9	KANNAN	67	M	589871	RE	R 6/36, L 6/36	S	NA	CT	DE	DM	LA	MO	Tcut	NA	F	F	Nil	SC	R 6/36, L 6/36
10	BUVANESHWARAN	12	M	597562	RE	R 6/6, L 6/6	S	NA	CT	DE	Nil	GA	LO	Tcut	NA	F	F	Nil	SC	R 6/6, L 6/6
11	VIJI	15	F	508975	RE	R 6/6, L 6/6	S	NA	CT	DE	Nil	GA	MO	Tcut	NA	F	F	Nil	SC	R 6/6, L 6/6
12	KALPANA	16	F	501243	RE	R 6/6, L 6/6	S	NA	CT	DE	Nil	GA	MO	Tcut	NA	F	F	Nil	SC	R 6/6, L 6/6
13	ARCHANA	8	F	505984	LE	R 6/6, L 6/6	S	NA	CT	DE	Nil	GA	MO	Tcut	NA	F	F	Nil	SC	R 6/6, L 6/6
14	SANJEEV	3	M	509654	RE	FL	S	NA	CT	DE	Nil	GA	MO	Tcut	NA	F	F	Nil	SC	FL
15	HARIJA	17	F	538963	RE	R 6/6, L 6/6	S	NA	CT	DE	Nil	LA	MO	Tcut	NA	F	F	Nil	SC	R 6/6, L 6/6

S. No	Name	Age	Sex	Id no.	Eye	Vision	complaint	Mode of injury for blow out	Investigation	Diagnosis	Speciality clinic referrals	Anaesthesia	Approach	Incision	Implant used	Pre op EOM	Post op EOM	Intraop complications	post op complication	post op vision
16	MUNIYAMMAL	60	F	548621	RE	R 6/18 L 6/18	P	NA	CT, B	LY	GP	LA	LO	Tcut	NA	F	F	Nil	SC	R 6/18 L 6/18
17	KRISHNAVENI	54	F	542317	LE	R 6/18 L 6/18	P	NA	CT, B	LY	Nil	LA	LO	Tcut	NA	F	F	Nil	SC	R 6/18 L 6/18
18	KUPPAMMAL	65	F	552316	LE	R 6/18 L 6/18	P	NA	CT, MRI	LY	Nil	GA	LO	TC	NA	F	F	Nil	Nil	R 6/18 L 6/18
19	ANU	12	F	558963	RE	R 6/6, L 6/6	D	RTA	CT	BOF	OMFS	GA	IO	TC	NI	ER	ER	Nil	ER, D	R 6/6, L 6/6
20	ARUNA	23	F	569872	LE	R 6/6, L 6/6	D	AF	CT	BOF	OMFS	GA	IO	TC	AC	ER	ER	Nil	ER, D	R 6/6, L 6/6
21	NIRMAL	27	M	569217	LE	R 6/6, L 6/6	D	RTA	CT	BOF	OMFS	GA	IO	SC	TM	ER	F	Nil	SC	R 6/6, L 6/6
22	KARTHIK	18	M	571296	RE	R 6/6, L 6/6	D	BIB	CT	BOF	OMFS	GA	IO	TC	AC	ER	F	CB	Nil	R 6/6, L 6/6
23	ABDUL NADIR	6	M	574632	LE	R 6/6, L 6/6	D	BIB	CT	BOF	OMFS	GA	IO	TC	NI	ER	F	Nil	Nil	R 6/6, L 6/6
24	JOHN RAJA	12	M	589632	RE	R 6/6, L 6/6	D	BIB	CT	BOF	OMFS	GA	IO	TC	TM	ER	F	Nil	Nil	R 6/6, L 6/6
25	VINOTH	26	M	587412	LE	R 6/6, L 6/6	S	NA	B	HA	Nil	LA	MO	TC	NA	AR	F	H	Nil	R 6/6, L 6/6
26	AMARAVATHY	45	F	596321	RE	R 6/12, L 6/12	P	NA	B	IC	Nil	LA	LO	TC	NA	DR	F	Nil	Nil	R 6/12, L 6/12
27	YOUSUF	66	M	598741	LE	R 6/24 L 6/24	S	NA	CT	LI	Nil	LA	LO	Tcut	NA	F	F	Nil	SC	R 6/24 L 6/24
28	SATISH	24	M	524631	LE	R 6/6, L 6/6	S	NA	CT	LI	Nil	LA	AO	Tcut	NA	F	F	Nil	SC	R 6/6, L 6/6
29	NAGARAJ	39	M	516498	LE	R 6/12, L 6/12	S	NA	CT	RC	Nil	LA	AO	TC	NA	F	F	Nil	Nil	R 6/12, L 6/12
30	NIVETHA	28	F	582146	RE	R 6/6, L 6/6	P	NA	MRI	CH	ENT	LA	TN	TN	NA	F	F	Nil	Nil	R 6/6, L 6/6